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FOREWORD

by

W. Burns, C.I.E., D.Sc.,

Agricultural Commissioner with the

Government of India.

The Punjab Fruit Journal has been in existence for three years and is now firmly established as a successful venture in agricultural journalism. The service rendered by such a journal is considerable. It forms a permanent record of observations and experience; it is a medium for the dissemination of results of scientific research; it is a forum for the exchange of views; it keeps its readers in touch with what is going on in other countries; it can be useful as regards market information and as a vehicle for advertising.

The importance of fruit in the national economy and for national health requires such a journal and the Provincial Fruit Development Board of the Punjab (and particularly its enthusiastic Secretary—Sardar Sahib Sardar Lal Singh) are to be congratulated in the way they have met this demand.

FOREWORD

by

H. R. Stewart, Esquire,

C.I.E., I.A.S.,

Director of Agriculture, Punjab.

The Provincial Citrus Fruit Show which was organised for the first time in 1928 has now become an established annual event to which those engaged in both the fruit production and fruit preservation industries look forward, with considerable interest. This show was instituted in order to bring the producer and the consumer into closer touch, to make better known the quality of the different kinds of citrus fruit which can be grown so successfully in the Punjab, and to afford a suitable opportunity to growers of meeting and discussing their problems and difficulties and, if possible, of taking joint action for the promotion of the interests of this industry.

Since, therefore, one of the chief objects for which this show was founded is instructional in nature, it is fitting that on the occasion of the present show, the Punjab Provincial Co-operative Fruit Development Board should bring out a Special Number of its Fruit Journal, devoted to an account of some of the important results which have been obtained in recent times by the research done by the Punjab Agricultural Department for the improvement and encouragement of the fruit industry. This research at present covers a wide field. It embraces all important aspects of the industry from the initial production of the fruit nursery plant to the final marketing of the fresh fruit and to the profitable conversion of surplus or cull fruit unfit for the fresh fruit market, into fruit products of various kinds.

Unlike annual field crops, fruit trees require a period of years before they reach maturity and hence, considering the short period

which has elapsed since concentrated research on the various aspects of fruit growing was initiated in the Punjab, many of the experiments are of necessity still incomplete. Nevertheless, short though this period has been, results of considerable economic importance are already available in the direction of physiological, entomological, mycological, cultural and manurial treatments of fruit trees, and in the profitable utilisation of inferior class fruit. This last line of investigation is of special importance for without a means of converting surplus fruit into suitable products the fullest economic returns cannot be realised from the fruit industry.

By bringing together in one volume the principal results of the Department's research into all aspects of the fruit industry—information which at present is scattered in a variety of reports and publications, or in some cases has not seen the light of publicity—this Journal will be doing a service of great value to all who are engaged in or connected with one or other aspect of this rapidly growing industry.

PREFACE

Scarcity of reliable literature on horticulture pertaining to Indian conditions is, rather, a matter of great humiliation to the Indians in general and the horticulturists in particular. If an average fruit grower is groping in the dark in vain about the suitability or otherwise of certain horticultural practices, his more enlightened brother, a student of horticulture studying in an Indian College or University, is also dependent on horticultural books written by foreigners and dealing with conditions in foreign countries.

In other horticulturally advanced countries of the world, one finds hundreds of standard horticultural books and scores of high class horticultural journals, weeklies, and monthlies etc., and many of them devoted to the cultivation of even individual fruits like Citograph in California and Haidar in Palestine. But this sub-continent of ours cannot claim to have a few standard books on horticulture; nor even a single high class journal, devoted exclusively to horticulture, excepting a very humble one—the Punjab Fruit Journal, which has been recently started by the Punjab Fruit Development Board. And this fact alone speaks volumes of the dire neglect shown in this matter by the authorities concerned.

A suggestion has been made that a beginning, no matter, however small, must be made in this direction. To this

end, all provincial horticulturists throughout India may be requested to compile briefly all the available and authentic information about the fruit industries of their respective provinces. And this information may be made available to the public from time to time as it has been done recently by the Punjab Fruit Development Board by publishing bulletins on the fruit industries of Egypt, Palestine, Italy and Sicily, France and Switzerland, and Kashmir.

This issue of the Punjab Fruit Journal is devoted exclusively to the Punjab Fruit Industry and includes information on numerous topics such as (a) the total area under fruits in the Punjab, (b) suitability of various tracts for different fruits, (c) varieties of different kinds of fruits found most suitable to the climate and soil of the province, (d) results of experiments so far conducted in the Punjab and recommendations made by the Agricultural Department in regard to the methods of propagation, top-working fruit trees of inferior varieties to better ones, manuring, topworking, root pruning, ringing, inter-cropping, windbreaks, packing of fruits, sunburn, preservation or canning of fruits and vegetables and manufacture of various fruit products as well as control of important insect pests and diseases etc. It will be observed that results of various experiments are

given in popular language and as briefly as possible to economise in space. In many cases where detailed results of the experiments are given in other journals or special Government bulletins or leaflets, the readers are referred to such publications.

At the end of the special number, is given, a complete list of all the publications, leaflets, bulletins, etc., so far published by the Government as well as a list of all articles of importance, contributed so far by the members of the Punjab Agricultural Department concerning any phase of the Punjab Fruit Industry. This special number is more than double the size of the ordinary issue of the Punjab Fruit Journal but is being supplied to members of the Board free of any extra cost. It is hoped to make this issue available to the public on the occasion of the Punjab Fruit Show to be held at Lahore from 7th January, 1940 and the Annual meeting of the Punjab Fruit Development Board, to be held at Lahore on January 10, 1940.

Chapters relating to fruit insect pests and diseases have been kindly contributed by my able and enthusiastic colleagues, Dr. Khan A. Rahman, Government Entomologist and Dr. Abdus Sattar, Government Assistant Mycologist. The rest of the material in this issue has been contributed by the Fruit Specialist and his staff; more particularly, S. S. Lal Singh, S. Bal Singh, Dr. G. Lal, Dr. Sham Singh, Mr. H. S. Dinsa, Dr. A. Aziz,

Ch. A. Hamid. Mr. G. L. Tandon, Mr. Maya Das, M. Ahmed Khan, Mr. B. S. Mahngar, S. Basant Singh, L. Amolak Ram, and S. Dyal Singh. Mr. K. L. Kohli, Asstt. Secretary and Sardar Manohar Singh, P.A. to the Honorary Secretary, took a great deal of trouble in arranging the material in proper form.

The Board is indeed highly grateful to the above gentlemen who had to compile all the material in considerable hurry and get the whole work done and the special number issued within a period of practically one month. It has been all a labour of love for the members of the Agricultural Department since they have done the work without any remuneration and in their spare time outside their normal duties, when they could have been expected to enjoy a well earned rest. My thanks are also due to the Hon'ble Sir Shahab-ud-Din, President of the Punjab Fruit Development Board, who, in spite of his onerous duties as Speaker of the Punjab Legislative Assembly, manages to spare a great deal of his time to give his able guidance in all important matters, concerning the working of the Board, and secondly to Mr. H. R. Stewart, Director of Agriculture, Punjab, for his valuable help in several directions.

Lal Singh, (CHIEF EDITOR),

[Fruit Specialist, to the Government, Punjab; and Honorary Secretary, Punjab Fruit Development Board.]

The PUNJAB FRUIT JOURNAL

Vol. IV]

Lyallpur, January, 1940

[No. 13

Survey of Fruit Industry

by

S. S. S. Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.),
Fruit Specialist, Punjab.

Area under fruits and higher standard of gardening :—The Fruit Section was established in July 1926 with the appointment of the Fruit Specialist with one assistant. More staff has been added from time to time so that it is easily the biggest section of its kind in India at present.

The very first thing done was to find out the total acreage under fruits and the condition of existing gardens. Excluding millions of date palms,* mangoes, jamans, ber etc., growing in scattered condition on the borders of fields, roads, canal banks, etc. the total area under fruits in solid blocks in 1928 was estimated at 49,323 acres. This area increased to about 62,000 acres in 1933, according to the figures supplied by district revenue authorities, thus mark-

ing an increase of about 25%. The latest figures are not available as yet, but there is no doubt that considerable increase must have taken place since then. These figures however do not depict the true position as regards the new area being planted since large areas of old uneconomical gardens are being uprooted and planted anew, and this is all to the good of the industry. The sooner the old gardens go out of existence the better, because most of them are not only stocked with inferior kinds of fruit trees, haphazardly planted, more in the form of a jungle than gardens, but are also the breeding centres of diseases and insect pests. It is gratifying that old pleasure gardens are giving way to commercial orchards planted on modern lines.

Increased consumption of Fruit :—

The improvement in the fruit industry is easily evident when we recollect that,

*There are two million. of female date palms in Multan, Muzaffargarh and D. G. Khan districts.

only about 15 years back, malta fruit used to decorate the table of only the well-to-do and rich people, the price ranged from one to two annas per fruit. Now the fruit is within the reach of an average man in the street. It does not cost more than a pice or two per fruit in season and sangtra at less than a pice each. Even juice-stands are springing up in the cities where people of average means are seen enjoying the refreshing and healthiest drink of orange juice at about six pice or so per glass, which is slightly more than the price of aerated-coloured-water, that abnoxious drink, not only having absolutely no food value, but also many a time prepared under very unsanitary conditions.

More authentic advice available :—

Fruits like grape fruit and persimmon that were formerly unknown are also becoming popular. New varieties of fruits are being introduced and the Department is in a position to recommend better varieties of fruits suitable for various localities. As a result of the large number of experiments conducted, the Department is now able to give more authentic advice on various aspects of fruit gardening such as proper layout of a garden, suitability of soil, methods of propagation of fruit trees, pruning, manuring, inter-cropping, planting wind breaks, protecting trees against sun-burn or frost or the ravages of insect pests and diseases. Cold storage experiments conducted at Lyallpur would enable the people to know how best the fruit can be stored for long periods.

Fruit growers being organised :—

The fruit growers of the province are also being organised into the Punjab

Fruit Development Board and District Fruit Growers Associations which may play a very important part in the development of fruit industry on right lines, especially in raising the standard of gardening, and in the purchase of garden requisites and sale of their produce on cooperative basis etc.

Fruit Preservation :—Last but not the least important are the experiments on the preservation (canning and bottling) of fruits and vegetables and manufacture of various by-products. This branch of science was almost unknown in the Province about a decade back, in the modern sense of the term. But now a great awakening has taken place in this direction. Hardly a bottle of squash of any type was produced in the Punjab some years back but at present, about three lacs of bottles of citrus squashes alone are estimated to be produced annually and it can be safely predicted that within the course of next one or two decades juice industry alone will be worth thirty to forty lacs of rupees a year and fruit preservation may soon become an important industry in the Province.

Two fold object, i.e. Fruit at low price to the public and reasonable profit to the grower :—While increased production of fruit, with consequent reduction in price, is welcomed by the consumers and is gratifying from the national health point of view it has nevertheless created apprehensions in the minds of prospective fruit growers that fruit growing might become unprofitable after some time. There should, however, be no fear on this score. While it is true that the

Department wishes to increase the consumption of fruit (which is possible if the same is available at reasonable price to the general public), it nevertheless wishes the fruit growers to make reasonable profits. This can be done only if the cost of production per maund of fruit also is reduced proportionately so that a grower can make reasonable profits even after selling the fruit at comparatively low price. This is being attempted by the Department in several ways such as

- (a) reducing the cost of production,
- (b) increasing the yield of fruit per tree or per acre,
- (c) utilizing the surplus or unsaleable fruit for various bye-products and prolonging the period of availability of fruit to the public. These are discussed briefly as under :—

(1) Reducing the cost of production :—Cost of plants has been very greatly reduced. Formerly a fruit grower had to pay from Rs. 1|8|- to Rs. 2|8|- or even more per plant of Blood Red malta i.e. an expenditure of Rs. 200| -| to Rs. 300| -| per acre on plants alone, and many a time the plants, even purchased at this high rate did not turn out true to type. At present the Department charges only -|6|- per plant of Blood Red and -|5|- for other varieties of maltas and similarly low prices for other fruit trees; so that the cost of plants alone, which used to be the major item of expense, has been reduced to 1/4th.

Even in regard to the maintenance charges of the garden there has been a considerable reduction to a grower. More intelligent 'Malis' trained in fruit

growing are available at reasonable wages. A considerable income can be obtained by the grower by raising intercrops in the garden until such time as the fruit trees start bearing and, in fact, even after they come into bearing. In some cases growers are able to get almost as much income from intercrops in the garden as from crops on the land where no fruit trees exist. This matter has been discussed in detail under intercrops in this Journal.

(b) There has been a considerable increase in the yield of fruit per tree or per acre due to the better system of laying out gardens and stocking the same with varieties of trees yielding larger quantity of fruit and of superior quality. In the case of most old citrus gardens yield per malta plant would not average more than 50 fruits per tree on acreage basis and in some cases it may be much less. In the case of modern gardens an average of 200—300 fruits per malta tree is quite common although many trees here and there may be seen bearing even 500 to 1,000 fruits each. There is no doubt that a grower can expect much greater yield of fruit from his garden at present than was the case some years back.

By proper organization of the fruit growers, which is being attempted at present, the growers will be able to cut down their cost of production by purchasing the garden requisites on co-operative basis and also cut down the middle man's profit. Improvement in the marketing of fruits that is being attempted at present by the Government would certainly lead to better grading, packing and more efficient marketing of fruits, so that a fruit grower gets reasonable share

of the price paid by the consumer. At present too big a slice is taken away by the middle-man.

(3) The fruit preservation industry which is rapidly expanding would also be instrumental in utilising a large quantity of fruit that is being dumped in the market at present. Manufacture of orange squash, lemon squash, Lime Juice Cordial, Marmalade, Candied peels and other bye-products of citrus fruits such as citric acid, pectin and essential oil, etc., also mango squash, mango slices, dried mango juice (Am-papar), mango chutney, mango pickles, Jam, Jellies, Preserves, Candied fruit, etc., as well as preserved fruits of various kinds should consume a considerable portion of the fruit produce. People are awakened more and more to consider fruit as an important part of their diet. Thousands of fresh-fruit-juice stands in all cities of the province which are bound to spring up very soon and where people may get fresh juice drinks at reasonable price would also remove surplus fruit from the market. At present tens of crores of bottles of coloured aerated drinks with fanciful fruit names, are being used throughout India. The Punjab alone uses about 4-5 crores a year. The day is not far off when public will demand and manufacturers will have to use real fruit juice in these aerated sweet drinks and this would be responsible for consumption of a great deal of fruit to the benefit of growers, consumers and manufacturers alike. It will give impetus to even sugar industry as sugar will take the place of saccharine at present used in aerated sweet drinks. In the absence of cold storage facilities the practice

at present is to dump all the available fruit in the market with the result that fruit is sold very cheap for a short period and after its season it cannot, perhaps, be had except at fancy prices. This is detrimental to both the grower and the consumer.

Cold storage experiments carried out by the Fruit Section show that Malta fruits can be kept even until July in excellent condition and pears stored in August could be kept until January. Similarly other fruits can be kept for long periods in cold storage without much spoilage. So there is great scope for cold storage industry in the Punjab, the establishment of which would remove surplus fruit from the market and make it available to the public at reasonable prices in and out of season. The writer had discussed this question previously in one of the articles entitled "Is there real danger of over production of fruit in the Punjab" in the issue of September 1937.

The Punjab fruit growers should have absolutely no apprehension regarding fruit farming becoming unprofitable for, at least several decades to come, as, after all, the total area under fruits in this Province at present is only 60 to 70 thousand acres and a good deal of this is worth uprooting. This works to about 2 acres for every thousand acres of cultivated area or about 1 acre for every 500 men in the Punjab. These are insignificant figures as compared with States like California which has about 1 acre for every 2½ men and Palestine 1 acre for every 5 men. The latter, with a population of only about 1 million

(equivalent to one district of the Punjab). exports 3-4 crore rupees worth of citrus fruits alone, whereas Italy's export in garden produce (1932) amounted to 1|3rd of her total export.

With our excellent canal system, variety of climate, rich soil, cheap labour, hardy peasantry and a solid backing from the government, we should be able to build up a decent export trade.

گھر کی بجلی

کے ذریعہ
ہر وقت - ہر جگہ - دیہات میں - شہکار پر کیمپ میں - پہاڑ پر
بجلی کے پنکھے اور بجلی کی روشنی کا لطف اٹھائیے

(CAPACITY 300 WATTS) ۳۰۰ واٹ کی طاقت ہے۔

- (۱) گھر کی بجلی سے ریڈیو اور موٹر کار کی بیٹری چارج کی جاسکتی ہے۔
- (۲) گھر کی بجلی سے ۱۰ واٹ کے نیس لمپ روشن کئے جاسکتے ہیں۔
- (۳) گھر کی بجلی سے ہر وقت پنکھا چل سکتا ہے اور روشنی مل سکتی ہے۔
- (۴) گھر کی بجلی کا وزن صرف پینتیس سیر ہے۔ اسلئے ہمیشہ ساتھ رکھی جاسکتی ہے۔
- (۵) گھر کی بجلی کی روشنی نہایت اعلیٰ اور کم خرچ ہے۔ ایک گیلن پٹرول سے ۱۲ گھنٹہ انجن چل سکتا ہے۔ اوسطاً دو یا تین گھنٹہ سے زیادہ روزانہ انجن چلانے کی ضرورت نہیں۔ باقی وقت بغیر انجن چلائے ہی بیٹری سے روشنی مل سکے گی۔
- (۶) گھر کی بجلی نہایت مضبوط - نہایت آسان - کم وزن - کم خرچ ہونے پر بھی ہر طرح سے قابل اعتبار ہے۔

گھر کی بجلی ہر مکمل سیٹ بمبہ بیٹری صرف میں لاہور کو عام سے مل سکتی ہے

میسرز سرروپ اینڈ مینس لیٹل لمیٹڈ دی مال لاہور

تارکاپٹ
SARBANSI

فون ۴۱۹۴

Ten Years of Fruit Shows (1928-38)

by

Mr. P. Maya Das, B.Sc. (Agri.),

Fruit Section,

Lyallpur.

The Punjab Fruit Show has now become an important annual function. It will be of interest to the readers to know its progress since its inception in 1928 when the First Show was held in the month of November under a small "Shamiana" in the Lawrence Gardens, Lahore. At this show exhibits were received not only from all parts of the Punjab but also from distant places like the Kashmir and Mandi States, Bombay, Agra, etc. A great deal of inconvenience was however caused due to torrential rainfall on this occasion. The "Shamiana" could not provide much protection from this incidental onslaught of nature.

But this did not dampen the enthusiasm of the organizers of the show who decided to hold the show in future, under roof. Consequently the success of this show encouraged its organisers to decide that fruit shows be made regular annual functions for the future.

The 1929 Annual fruit Show was held in the Y.M.C.A. hall in Lahore. This attempt proved a great success and stimulated a healthy rivalry amongst the fruit growers who exhibited their fruit for competition.

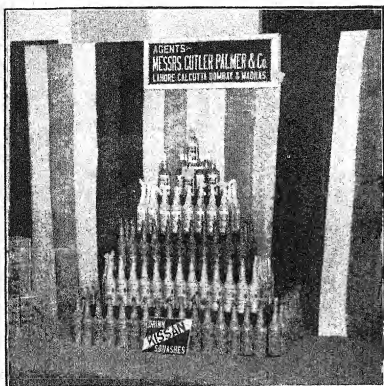
Unfortunately no show could be held in the following year (1930) on account

of financial stringency but the show in 1931 more than made up for the set back of 1930. The Y.M.C.A. Hall having proved insufficient on the previous occasion, the Town Hall, Lahore was secured to house the show.

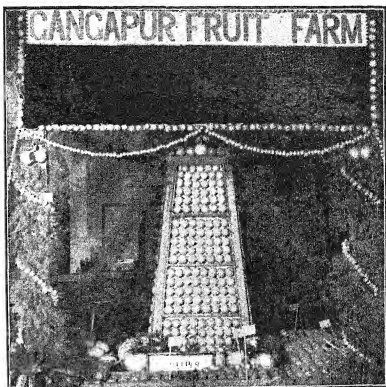
An additional programme was arranged during this show which included popular lectures on fruit farming and fruit preservation. A meeting of provincial fruit growers was also held for the first time where they discussed their difficulties and problems confronting them. It was in this year that the first Mango and date Fruit Show was organized at Muzaffargarh.

The year 1932 saw a decided improvement in the organization of the Annual Fruit Show, and even though the Town Hall proved too small for the large number of exhibits, it was arranged in a very attractive manner with a large number of coloured placards regarding the dietetic value of fruits, co-operation, and several other interesting items.

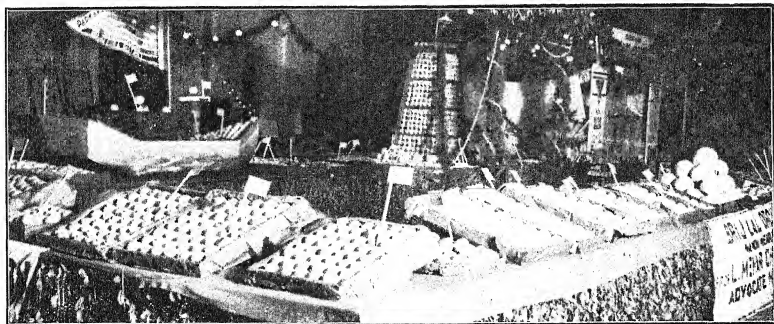
The Provincial fruit growers meeting held on this occasion, discussed among other important items, the formation of the Punjab Fruit Growers Association. It is interesting to note that the Punjab



"KISSAN" Fruit Products Stall 1939



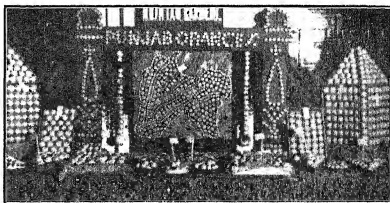
Gangapur Fruit Farm Stall 1939
Awarded 1st Provincial prize



General view of the Annual Citrus Fruit Show 1939



H. E. The Governor of the Punjab's visit
to the Annual Citrus Fruit Show 1939.



Mushiaq Gardens Fruit Stall 1939.
Awarded 1st Prize for Small Fruit Growers.

Provincial Co-operative Fruit Development Board is the outcome of this discussion.

Since the Town Hall, too, proved inadequate to house all the exhibits, it was decided in 1934 to procure the Punjab University Hall, Lahore, for the Annual Fruit Show. Since then the organisers have been extremely lucky in being able to secure this hall every year for the show.

In this show which was held in the month of January, the judges were particularly impressed by the large number and high quality of exhibits of preserved fruits and fruit products. The citrus fruits exhibited, also reached a very high standard.

This was the first year when several District Boards contributed towards prizes for the best exhibits from their respective districts.

The Punjab fruit growers met under the presidentship of the Financial Commissioner (Development) and discussed ways and means of inaugurating and financing the Punjab Fruit Development Board. A Committee was appointed to frame bye-laws, etc., with the Hon'ble Ch. Sir Shahab-ud-Din as the chairman.

The year 1936 was a still bigger stride, so far as the Annual Fruit Show was concerned. It was this year that Mr. H. R. Stewart, Director of Agriculture, on the suggestion of the Punjab Fruit Development Board, decided to award, suitably engraved silver medals instead of cash prizes as a more lasting evidence of the achievements of exhibitors. This show also marked the foundation of challenge cups for fruits and fruit pro-

ducts. Out of the three challenge cups offered for competition two were contributed jointly by Mr. W. Roberts, (now, Sir), Col. E. H. Cole, Major D. Vanrenan, K.B. Nawab Fazal Ali, R.B. L. Sewak Ram, L. Balak Ram, Mr. Mehar Chand Mahajan, Dr. Ganda Singh Cheema, S. B. Ujjal Singh, Mian Nur Ullah, S. Sampuran Singh, S. Bishen Singh, Raja Hari Kishen Kaul and K.B. Sardar Habib Ullah. The third was presented by the Indian Mildura Fruit Farm, Renala Khurd, and was called the "Kissan" Cup.

The great success achieved by this show is manifested from the number of entries received. These were 388 as compared with 262 in 1935 and 228 in 1934.

The quality of the fruit was definitely better and a striking feature was the considerable improvement made by many competitors in the method of displaying their exhibits.

The first annual meeting of the Punjab Provincial Fruit Development Board was also held on this occasion.

The Annual Fruit Show at Lahore represented only a part of the picture of the Fruit Industry. In the year 1936 many other district and divisional fruit shows were also held during the summer months, such as the Divisional Mango and Date Fruit Show Multan, Mango Shows at Jullundur and Kamal and the Provincial Hill Fruit Show at Simla.

In the year (1938) the show proved a great success again. A very notable feature being the most elaborately decorated stalls put up by some of the exhibitors. Prominent among these were

"Taurus the Bull" put up by the Mushtaq Gardens, The "Kissan" Fruit Stall, "The Clock Tower" by the Montgomery Fruit Farm and the Diwana Fruit Farm Stall.

A very large number of entries were received for the show and the figure reached 410, beating all previous records.

It was unfortunate that the Simla Fruit Show could not be held this year for want of a suitable building.

The 1939 Fruit Show was an unprecedented success so far as entries were concerned; and the previous years record was enhanced by a large margin. The fruit product section showed a much greater improvement in quality and number.

A new feature in the last Annual Fruit Show was that, of judging entries in the Malta orange class on the basis of the actual chemical analysis of the fruit from each separate entry. This was done to facilitate or verify the correctness of judgment, as very often two samples, though alike in taste, show appreciable differences in sugar and acid contents. This way of judgment eliminated many errors committable in judgment by way of simply tasting the fruit.

The data collected from these tests has been carefully preserved as it may reveal interesting results in connection with research on the quality of fruit from various localities.

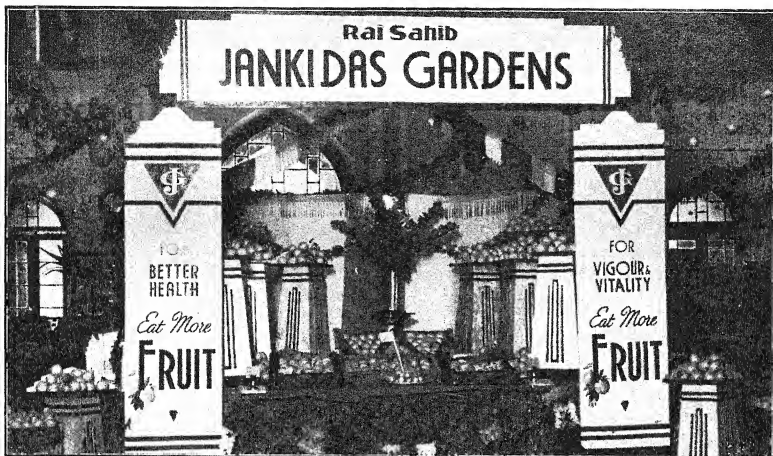
Home made products exhibited by two ladies who had received training in this line in one of the short courses conduct-

ed at the Punjab Agricultural College, Lyallpur, elicited great interest.

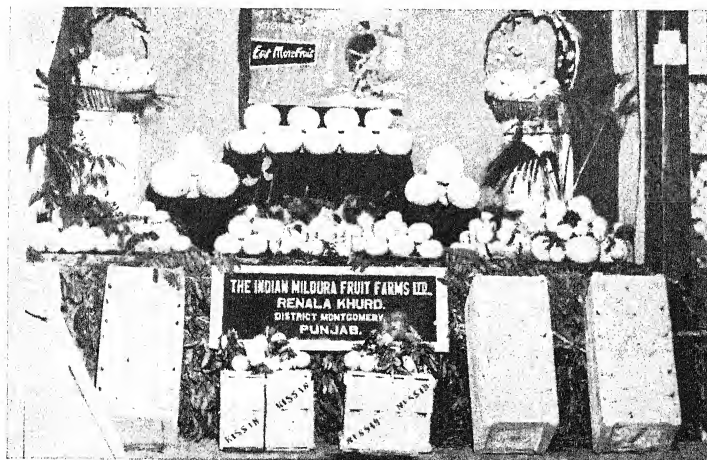
To the casual visitor a fruit show means perhaps a little more than a place of pleasure where he can satisfy his aesthetic sense to a certain degree. But to a fruit grower who is exhibiting his fruit, it means more than merely winning a prize. If he wins a prize for his fruit it means that his fruit would be in greater demand by the consumer; and if by chance he does not win a prize, it arouses in him that keen desire of healthy competition which makes him restless until he has been able to improve the quality of his fruit and win a prize in the shows. The first ideal of such shows is therefore, to bring together Fruit growers from different parts of the Province and arouse in them the spirit of healthy competition. This not only gives an impetus to the fruit growers to improve the quality of their respective fruit but in the long run raises the standard of fruit growing in the province as a whole.

The Punjab as a province can boast of growing some of the best varieties of citrus fruits, but very unfortunately the majority of the commercial orchards do not possess the very best of these which are sometimes found growing in otherwise unimportant gardens unknown to many people. It was only with the advent of the Fruit Shows that many trees of outstanding merit have been discovered. The Punjab Fruit Specialist, immediately set about to procure buds from these trees and further propagate them for supply to the public.

It is our object, therefore, to bring all those interested in the Fruit industry of



R. S. Jankidas Gardens Fruit Stall 1939.



"Kissan" Fruit Stall 1938



the Province, into closer contact with each other and to bring to their notice the best varieties of citrus and other fruits grown in the Punjab with a view to encourage the production of better varieties, also to popularize home and manufactured fruit and vegetable products and to induce dealers to practise better methods of displaying their fruits. It is also our purpose to make the prize winning fruit at the show mean more than a medal and a cash prize. We hope to make it nationally known that the fruit which wins the prize is worthy of that distinction, and make that fruit sought after by the public. We feel that the grower who produces fruit, fine enough to get the award, after having been

judged competently, should be entitled to some recognition, because of the care he has exercised in bringing the quality upto so high a standard.

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پنجاب فروٹ لمائٹس ۳۷-۱۹۳۶ء میں اول انعام پانے والے سرخ مالٹہ کے پودے
بخشی کنھیا لال ایڈووکیٹ میونسپل کمشنر، گوجرانوالہ کے باغ سے خرید کر دیں -
مالٹہ پھل کا ملاحظہ دسمبر و جنوری میں فرمائیں۔

Please mention this Journal while replying.

Facilities for Training in Fruit Culture and Fruit Preservation

by

S. S. S. Lal Singh, B.Sc. (Hons.),

M.Sc. (Calif.)

Fruit Specialist, Punjab

and

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Assistant Professor of Horticulture,

Punjab Agricultural College, Lyallpur.

Until recently gardening was only practised as a hobby by the rich people who did not plant gardens for commercial purposes. These hobby gardens were wholly managed by illiterate malis who did not possess any knowledge of even the fundamental principles of horticulture. That is why the old pleasure gardens presented a hopeless sight when examined from any point of view of the present day scientific horticulture. Many of the newly planted gardens are an example what education of people can accomplish in such a short time.

There is a saying in the United States of America that if people cannot come to the university for education, then let the university go to the people, to spread knowledge and enlightenment throughout the nation. This maxim has been practised so far as the teaching of horticulture is concerned. The teaching of this subject is not confined to the four walls of the Punjab Agricultural College. For the benefit of those who cannot join

the college, several short courses in fruit culture as well as in fruit and vegetable preservation are arranged every year both at Lyallpur and other centres in the Punjab, wherever there is sufficient number (say 25 to 30) of those desirous of such training. People should take full advantage of these courses. For the benefit of readers, full information about all such courses is given below.

Degree Classes.—Since the creation of Fruit Section in 1926, teaching of horticulture has been steadily improving in the B.Sc. (Agri.) classes of the Punjab Agricultural College, Lyallpur. With the appointment of an Assistant Professor of Horticulture and of a demonstrator in 1938, the instructions in this subject to the IV year class have been considerably enlarged.

From 1940 onwards the IV year class students will be enabled to take up Horticulture, according to plans now underway, as a separate sub-

ject from Botany, of which it now forms a part in the University Curriculum. Under this system agricultural graduates will be available with Specialization in Horticulture.

Those desirous of getting a post graduate research training, can do so even now, as Horticulture is one of the subjects for the M.Sc. (Agri.) degree of the University of the Punjab. There are three students working this year for their M.Sc. Degree in Horticulture.

Besides teaching horticulture to the IV year class, it is also being taught to the III and IV year class students who take Botany as a subsidiary subject for the B.Sc.

OTHER REGULAR CLASSES IN HORTICULTURE

(1) **Advanced Course in Fruit Preservation.**—With the development of the fruit preservation industry it was felt that there will be need for technical men without which the position of the industry will not be on a sound footing. With the above in view, Advanced Course Class in fruit preservation was started in 1937 and about six students are admitted every year. In this course, lasting for seven months, the students are given thorough training in the semi-commercial production and chemical aspect of various fruit products such as manufacture of fruit juices and squashes; canning of fruits and vegetables, manufacture of jams, jellies and marmalade, manufacture of sauces, pickles, vinegar, etc., etc.

Most of the students of previous two batches have either started their own

business or have been employed by various firms engaged in the manufacture of fruit products. Students from outside the Punjab, have to pay, besides Rs. 20/- p.m., an additional sum of Rs. 470/- each for this course. This year's class contains two stipendiary students, deputed by the U. P. Government and one sent by Messrs. Harnarain Gopi Nath, Khari Baoli, Delhi, well-known for crystallized fruits, jams and pickles throughout India, for training in this subject.

(2) **Mali Class.**—For trained "Malis" considerable demand existed and could not be met with, due to the lack of properly trained malis. In order to meet this demand and replace the old type of illiterate and ignorant malis, a 'Mali Class' (one year class) was started in October, 1935. This is a course of practical horticulture providing instructions in all the operations connected with fruit gardening, floriculture and some knowledge of vegetable growing. The students trained in this class are well versed in the nursery production and other cultural operations, carried on in a fruit garden. So far 85 students have received training in this class and most of these have found employment in government and private gardens and nurseries and are proving successful in their work.

(3) **L. C. Class of the Punjab Agricultural College (Two years course).**—From this year onwards this class will also get training in the fundamental principles of Horticulture. Formerly, the syllabus dealt with General Agriculture alone.

(4) **The Vernacular Class (a one year class)** is also receiving some training

Advisory Work by the Department of Agriculture, Punjab

by

S. Bal Singh Bajwa,

B.Sc. (Agri.) Punjab, M.Sc. (Calif.)

Assistant Fruit Specialist, Punjab.

There is hardly any branch of Agriculture in which timely advice is more necessary than it is in fruit gardening. Mistakes once committed, either in the selection of land and site or in the selection of plants, or in the layout of the garden, are not easy to rectify, due to the fact that a fruit tree has a much longer life, as compared with other crops. An intelligent zamindar must take advice of the department both in the upkeep of his existing garden and in the layout of the new one. This important phase of the work is being attended to, in various ways, such as holding provincial and district fruit shows to popularize best varieties, issuing a large number of leaflets, both in English and Vernacular, on various operations of gardening, for free supply to the public, giving radio talks and delivering lectures on various occasions like public fairs, agricultural associations, educational conferences, etc., where, as far as possible, demonstrations are also arranged. Short courses of few days' duration are held in various parts of the province, wherever there is a demand from a reasonable number of growers.

As a result of these, it is gratifying to note that a large number of the newly laid out gardens are comparatively free from the usual defects which exist in old gardens and which were responsible for their failure.

Demand from the public for advice is indeed very great and only a small portion of it can be met due to the very limited staff of the Fruit Specialist. Nevertheless, prospective fruit growers are strongly advised to take the fullest advantage of the facilities mentioned above, and become regular subscribers to the Punjab Fruit Journal and consult their local Agricultural Inspector who would either render advice himself or failing that would refer the matter to the Government Fruit Specialist. Previous experience shows that there is a great rush for advice, just near the planting season, in regard to various matters like selection of varieties, supply of plants, plan of the garden, visiting the site, etc., with the result that a large number of growers have to meet disappointment. They should seek advice several months before the planting season begins.

Causes of Failure of Old Gardens

by

S. S. S. Lal Singh, B.Sc. (Hons.),

M.Sc. (Calif.),

Fruit Specialist, Punjab.

Among the many causes that have been responsible for the failure of many old orchards in the Punjab, it will be worth while mentioning a few of the more important ones.

I. Fruit Gardening, has mostly been in the hands of illiterate people. Gardens are owned generally by rich or intelligent men but left to the mercy of ignorant Malis.

II. Fruit gardens were laid out, more or less, as pleasure gardens, rather than as commercial propositions. There are consequently elements of wastefulness and extravagance in their layout and upkeep.

III. In 99 per cent cases, fruit trees are of inferior variety and the quality of fruits is generally very poor.

IV. In many cases gardens are planted on unsuitable soils, with varieties of fruits unsuitable for the climate.

V. Varieties of fruits that have no

common cultural, soil or irrigation requirements, are jumbled together. Commercial gardens should necessarily be confined to a few selected varieties of proved merit. Not a single owner, in the whole province, can boast of a garden devoted entirely to one or even a few selected varieties of any fruit.

VI. Pruning of fruit trees is not practised.

VII. The methods of manuring, irrigation, cultivation, etc., in vogue, in most of the gardens, are extremely defective.

VIII. Trees are generally too closely planted.

IX. Fruit diseases and insects are playing havoc in many gardens and the operation of spraying is almost unknown.

X. Lack of organization amongst fruit growers in regard to the purchase of garden requisites and the sale of fruits, which not only increases their cost of production but greatly lowers their income.

Hints on Orchard Hygiene

by

S. S. S. Lal Singh, B.Sc. (Hons.),

M.Sc. (Calif.),

Fruit Specialist, Punjab.

1. Cut off all diseased and dry branches and limbs; they spread disease, provide shelter for some insect pests and food to others.

2. Paint all wounds with coal tar or shellac varnish. Wounds provide suitable places for the entry of disease germs. Date palm weevil lays eggs in wounds.

3. Burn, or bury deep, or better compost (for manure) prunings and other orchard rubbish regularly; during winter many insects hibernate in such places.

4. Weedy orchards give protection and provide food to many pests. Mango mealy bug feeds on under growth before it climbs up the mango trees.

5. Remove growth of lichens from fruit trees (applicable to hilly tracts).

6. White-wash the trunks of your plants and hedges. Most insects avoid lime, and white-washing protects trees from sunburn.

7. Tall trees provide excellent roosting places for crows which are enemies of fruits. Avoid having too many such trees near orchards except those used as wind breaks.

8. Organize campaigns against fruit bats; shoot them in their roosting places.

9. Parrots live in the holes of trees. Fumigate holes with calcium cyanide and fill them up with cement. Kill parrots, they are utterly useless to man and are enemies of fruit growers.

10. Mole rats cut the roots of fruit trees and cause enormous damage. Fumigate their burrows with calcium cyanide.

11. Healthy and vigorous trees can withstand attacks of pests and diseases better; promote good growth by proper spacing, manuring, and good cultivation.

12. Plant high yielding, disease resisting varieties.

13. Cultivate your orchards, specially the soil under the fruit trees. This ensures the riddance from many pests. (Mango mealy bugs lay eggs in the soil round the base of trees, and fruit flies always pupate in the soil).

14. Attend to manure heaps (grubs of Rhinoceros beetle, her beetle, and some other pests live in it).

15. Religiously spray your orchards in winter. You will prevent the appearance of most pests and diseases.

16. 'A stitch in time saves nine', Kill pests as soon as they appear.

17. When in doubt or difficulty, write to the Department of Agriculture, Punjab.

Fourteen Commandments of Fruit Gardening

by

S. S. Lal Singh, B.Sc. (Hons.),

M.Sc. (Calif.),

Fruit Specialist, Punjab.

1. SOIL. Thou shalt not select for a fruit garden a Kallar soil or one with layers of gravel. Select soil that is loamy, rich, deep and well drained.

2. LAYOUT. Thou shalt not lay out thy gardens haphazardly. Use a well-thought-out plan with trees at right distance and thus enhance the beauty and life of thy orchards and avoid future worries.

3. PLANTS. Thou shalt not obtain thy plants from an unreliable source. Plant only healthy trees, those free from disease. A cheap tree proveth costly in the long run.

4. PRUNING. Thou shalt not leave thy trees to grow as in nature. Prune to shape thy trees, to maintain vigour and productivity. A "Vase" shaped tree with properly spaced branches is the best.

5. IRRIGATION. Thou shalt not allow irrigation water to touch the trunk of thy trees; but heap soil around it. Widen basins as far as the branches of thy trees spread.

6. CULTIVATION. Thou shalt not allow weeds to grow in thy garden.

Cultivation keepeth down weeds, conserveth moisture, and increaseth fertility.

7. MANURING. Thou shalt not starve thy trees. Heavy manuring secureth regular and heavy crops. Manure thy trees with well decayed farm-yard manure and apply green manuring wherever practicable.

8. SPRAYING. Thou shalt not let fungal and insect pests flourish unchecked in thy garden. Timely spraying saveth an orchard from ruin.

9. WIND BREAKS. Thou shalt not allow storms to damage thy trees and fruits thereof. Plant wind breaks around thy orchard to save thy trees from the effect of storms and hot dry winds.

10. INTERCROPPING. Thou shalt not leave the land idle when thy trees are young. Vegetables and leguminous crops, like senji, berseem, peas, gram, guara, etc., keep down weeds and give good returns.

11. SUNBURN. Thou shalt not allow the trunks of thy trees to get sun-burnt nor the fruits of thy citrus trees sun-scalded through hot sun-rays on the south west side. Whitewash the trunks

of trees and grow a row of jantar on their South West. This will prevent the bark of the trunks of thy trees from cracking and protect fruits from sun-scorch.

12. HARVESTING. Thou shalt not handle thy fruits roughly. Pick fruits gently; for rough handling injureth the skin of fruit and causeth early decay. Grade thy fruit according to size and quality and pack in cases of standard size.

13. MARKETING. Thou shalt not strive to sell thy fruit by thyself; nor through the contractors. Co-operative marketing giveth increased returns. Join the Punjab Provincial Co-operative Fruit Development Board and thy local district association.

14. SEEK GUIDANCE. Thou shalt not ignore the advice of the Agricultural Department. In all matters pertaining to fruit gardens consult the officials of the Department, because "A stitch in time saves nine."

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Best Use of Avenues

by

S. S. Lal Singh, B.Sc. (Hons.),

M.Sc. (Calif.),

Fruit Specialist, Punjab

Unfortunately people in India have not yet taken to the habit of growing fruit trees or other trees of economic importance along roads or avenues. Both in America and Europe, even road sides are planted with fruit trees instead of inferior and comparatively useless trees like *Kikar*, *Shisham*, etc. It is not uncommon to see in France even apple trees along the roads which yield good quantity of fruit. In Switzerland even along the main avenues in Geneva one finds chestnut trees nicely trimmed to various shapes. In the Punjab also one finds, although only in a few scattered localities, mango and Jaman trees along the main roads or along canal banks which are doing wonderfully well, though the fruit trees unfortunately planted there, are of inferior varieties. If the total length of all the trunk roads, arterial roads, as well as a net work of District Board roads along with the length of roads on canals and distributaries, etc. is taken into consideration, it will easily amount to many thousands if not actually to tens of thousands of miles. The exact figures are being collected. In many places land along the roads is wide

enough to accommodate several rows instead of one row on each side of the road. Even if 10% of the above is planted with tall, ever-green, shady fruit trees like mangoes, jaman, etc., it would accommodate lacs of fruit trees which would bring a large amount of revenue to the coffers of the state.

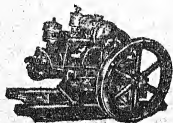
The above problem is proposed to be discussed in a comprehensive note when the necessary data is collected.

Even if avenues in the cities and those found in pleasure gardens are utilized for this purpose, they can yield substantial income and this is amply illustrated at the Punjab Agricultural College, Lyallpur, where one of the avenues is devoted to mangoes alternating with date palms (its photo is given elsewhere in this issue). The length of the avenue is only about 300 yards which has got 50 date palms of Basra varieties and 30 grown up mango trees of Langra variety. The average income from the date fruit alone from 42 grown up palms has worked out to Rs. 326 per year over a period of 14

years (1925-1939) besides the supply of date suckers, used in Government plantations. Mango trees were planted only 12—15 years back which have also come into bearing. These trees are largely used for taking mango grafts, of which 1 to 2 thousand are taken every year so that they can bear fruit only on upper branches not used for grafting. Still the average income from about 30 trees has been worked out to Rs. 253/- per year over a period of four years (1936—1939). One tree, from which grafts were not taken, yielded an

income of Rs. 43|14/- last year—the total income from dates and mangoes during 1939 amounted to Rs. 568/- besides 2,500 grafts. It is not intended to convey the impression that every zamindar can expect to get this income. But even 25% of this income should be welcomed in the days of depression as experienced by zamindars during the last decade.

Besides raising the income, tall date palms, along the avenue, carrying beautiful bunches of fruit of golden colour and weighing from one to two maunds per tree, present a most alluring sight.



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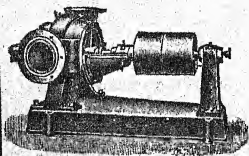
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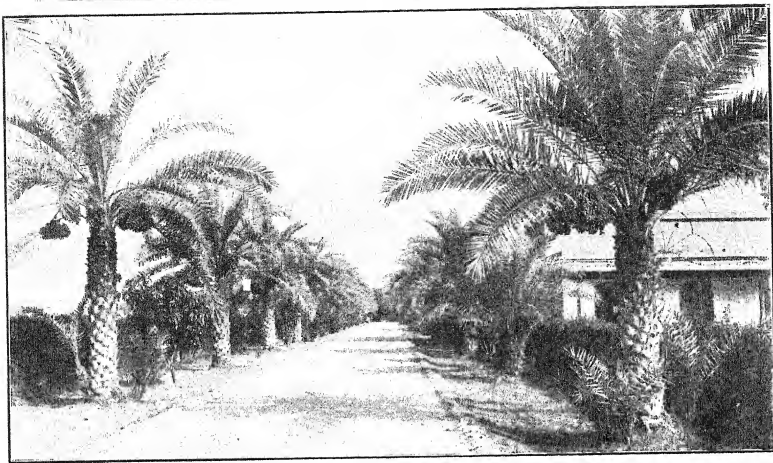
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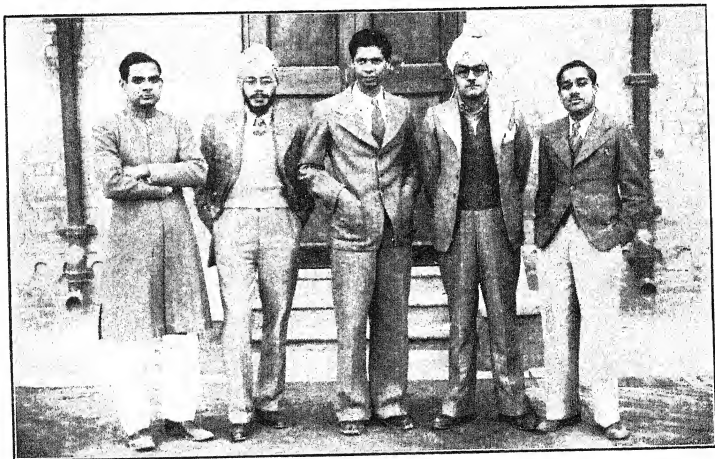
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Mango and Date Avenue, Punjab Agricultural College, Lyallpur. An important note regarding the economic significance of this avenue appears elsewhere in this issue.



Students of the Advanced Fruit Preservation Class 1939.

Left to Right : S. Z. Abad, G. S. Bajaj, Kailash Nath, Prithvi Raj, K. P. Bhargava.

Protecting Fruit Trees Against Sun-burn, Frost and Wind Storms

by

S. S. S. Lal Singh, B.Sc. (Hons.), M.Sc., (Calif.),
Fruit Specialist, Punjab.

Sun-burn.—Climate in most parts of the Punjab happens to be very hot. A good deal of fruit (especially in the case of Sangtra) gets sun-burnt particularly on the South West side of the tree, where rays of the sun are most intense. This subject is discussed in the chapter on Citrus Fruits. Many a time, trunks or main limbs of trees, if exposed to direct rays of the sun, also get sun-burnt resulting in cracking of the bark. Trees can be protected against sun-burn by various methods such as keeping the tree low-headed, by proper pruning or training, so that the trunk of the tree is protected against the hot rays of the sun by the shade of its branches. Sometimes the stems or trunks are covered with straw, paper or gunny cloth. Another very effective method is to white-wash the trunks of trees. For detailed information, readers are referred to a leaflet "Protecting fruit trees against sun-burn" published by the Department of Agriculture and which can be had gratis.

Frost.—Some of the fruit trees such as Mangoes, Kaghzi lime, guavas etc, are considerably damaged by frost or cold winds in severe winters. This subject has been thoroughly discussed in detail in leaflet No: 81, "Protecting trees against frost", published by and avail-

able, gratis, from the Fruit Specialist, Punjab.

Wind-Storms.—In most parts of the Punjab wind-storms and sometimes even dust-storms do an immense amount of damage to fruit trees. In some cases the winds are so severe as to blow off not only a major portion of the fruit but even uproot some of the trees. Experience has shown that in order to protect the fruit crop and fruit trees against damage by storms planting of trees as wind-breaks is indispensable. These should be planted in one or two rows all around the garden and, in order to be effective, must be tall, quick growing and should be planted fairly close together in the form of a hedge. In fact it is desirable to plant these trees even one or two years before the fruit trees are planted so that they will be tall enough by the time fruit trees come into bearing. Any kind of tree best suited for the locality such as Sheesham, Mulberry, Eucalyptus, Simbal, Seedlings of Mango, Jaman or Jamoa or even ber trees etc. may be grown.

For detailed information readers are referred to leaflet No: 69 on "Wind-breaks" published by and available from the Fruit Specialist, Punjab.

Inter-cropping the Garden

by

S. Bal Singh, B.Sc. (Agri.),

M.Sc. (Calif.),

Assistant Fruit Specialist, Punjab.

Inter-cropping of the orchard is a cultural phase of profitable fruit growing which has not received adequate attention at the hands of fruit growers of this province. Judicious inter-cropping would not only reduce the initial financial and capital burdens of the growers, but it will go a long way to improve the health of the trees and keep the orchard free from weeds. Crops should be grown in the space lying fallow between the trees, but care must be taken that adequate space is kept around the trees so that the inter-crop does not interfere with the developing root system and comes in competition with the same for nutrients. This space should always be kept clean and well cultivated or hoed. With the increase in size of the trees, this space around the trees should also be proportionately increased; safe rule being that the crops may preferably be grown as far as the spread of the branches.

The ideal course is to grow vegetables like potatoes, chillies, onions, radish, carrots, cauliflower, peas, etc., in case market facilities are available. Failing this even fodder crops like berseem, guara, or other leguminous crops like gram, cowpeas, beans, pulses, etc., may be grown. Liberal manuring, irrigation, hoeing, etc., necessary for the successful

cultivation of vegetables would provide conditions suitable for the healthy growth of fruit trees also.

Tall crops like maize, juar, sugarcane, bajra, etc., should not be grown. Besides being exhaustive they tend to shade the young trees and thus interfere with their proper growth.

As mentioned above the income obtained from inter-crops is an important factor. The readers will be interested to know that sometimes, income from inter-crops in a garden area is almost as much as from the crops sown on land not planted with fruit trees. Practically the whole of the 25 acre Experimental Fruit Garden at Attari was intercropped with gram, berseem, vegetables etc. last year, and similarly the 25 acre Progeny Garden at Risalewala is under crops like berseem, gram, peas, turnips and radish etc. The crops are really in excellent condition and we can safely expect as much income from the inter-crop of this garden as from a similar area of land not under fruit trees.

Ten acres of berseem at the Attari Garden was sold at an average price of Rs. 130/- per acre. Again, in the Government Fruit Garden at Multan Farm, four acres of Berseem intercropped in the garden fetched an income of about Rs. 600/- i.e., Rs. 150/-

per acre. Similarly the yield of gram as an inter-crop was 20 mds. per acre at Attari. Even in the case of well-established gardens bearing fruits for several years, experience has shown that cultivation of berseem as an inter-crop not only gives a very handsome fodder crop

but also enriches the soil and has been instrumental in increasing the vigour of the trees. This crop does not appear to suffer from the shade of the trees. The growers are therefore strongly advised to practise judicious inter-cropping in their gardens.

To Subscribers of the Punjab Fruit Journal

Most of the subscribers of the Punjab Fruit Journal started subscribing to the journal from April 1939. With the supply of this issue their annual subscription expires. They are requested to remit Rupees two by return to renew their subscriptions during this quarter, failing which the next issue of the journal will be sent per V. P. P. of Rs. 2/8/-

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Multiplication & Exchange of Approved Nursery Plants in the Punjab

by

S. S. Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.),
Fruit Specialist, Punjab,

Dr. Sham Singh, Ph.D. (Bristol),
Assistant Horticulturist, Lyallpur
and

M. Ahmad Khan, B.Sc. (Agri.),
Punjab, B.Sc. (Agri.), Edinburgh.

Till only recently the stock, planted in most of the orchards in the Punjab, was distributed directly or indirectly by private enterprise in U. P., especially at Agra. These nurserymen usually do not own orchards, but arrange to obtain budwood from various sources and, while so doing, no effort is made to collect it from really first-class trees. In other words, budwood from high and low yielding trees and from those bearing good, average and poor quality fruit, is collected to produce nursery plants. Since, as a rule, undesirable plants, i.e., those which bear light crop, yield the largest amount of budwood while the trees of outstanding merit yield but a poor amount of it, it is evident that promiscuous collection of budwood involves the production of an overwhelmingly large percentage of inferior nur-

sery plants, though some really first-class plants are also likely to be produced and disseminated. This explains why a large majority of trees in the old gardens throughout the province are low yielders, and that the individual trees show such a great variation with regard to yield and quality.

There is no known method by which nursery plants of good lineage, viz., those propagated from trees of outstanding merit, could be distinguished from those produced from inferior parent trees. Thus good and bad stock is usually sold in mixed lot and, unfortunately, for reasons explained above, the number constituting the bad stock, far exceeds the number of good plants. Then again, the plants of poor lineage would conceal their identity so long as they do not start bearing fruit, and all labour and

money spent by way of cultivation, manuring and pruning, etc., in the meanwhile, is wasted in case the plants turn out to be of inferior type. Such mistakes, made in the case of farm crops by way of bad selection of seed would tell on the business only once, as seed can be renewed after one harvest. In case of fruit trees, however, the grower would suffer a considerable loss over a number of years, if right selection of nursery stock has not been made in the beginning.

The survey of orchards, carried out in 1928, revealed that this practice of sale and purchase of nursery stock, prevalent in the province, may largely be responsible, in general, for low yields, poor quality of fruit and colossal variation in such respects, from tree to tree. With a view to check this growing menace, the Fruit Section, right from its inception in 1926, spared no efforts to bring home to the grower the evil effects of planting stock of unknown origin. It also repeatedly and frequently represented to the government the dire necessity of bringing into existence reliable nurseries for supply of genuine plants, which forms the real foundation of fruit industry. In spite of many obstacles from several quarters, which need not be mentioned here, consistent efforts were made to stop further spread of plants of unknown origin. Four definite lines were adopted to achieve this end; namely (1) Inducing and assisting the prospective fruit growers, who desired to plant gardens on a large scale, to produce their own plants by taking budwood from trees of known and good parentage. (2) Recommending to the growers, reliable nurseries, where stock of good

plants, free of pests and diseases may be available. (3) Producing plants of approved merit in government nurseries by using budwood from trees of outstanding merit existing both in Government gardens and privately owned orchards. (4) Organising the fruit growers of the province into district fruit growers, associations, and linking these associations finally to a central body known as the Punjab Provincial Co-operative Fruit Development Board Ltd., with headquarters at Lahore. This central body has been induced to take up the multiplication and exchange of plants, on scientific lines, as will be discussed later.

The first scheme, viz., helping the prospective fruit growers to produce their own plants, has proved to be a considerable success in so far as it has enabled some people to produce their own plants on a large scale for planting big orchards. Budwood was taken from trees of good quality existing here and there in various gardens throughout the province. The department helped the growers in selecting good trees for supply of budwood, and assisting in budding or grafting by supplying budders or malis. This scheme, while helpful to the big growers, could not be of much help to the small grower or beginner in the profession, as it does not pay to produce plants on a small scale.

The second scheme, i.e., helping the growers to secure plants from private approved nurseries also proved only a partial success. No doubt the nurseries on the approved list of the department were open to inspection of the departmental officers, and the proprietors of these nurseries had undertaken to keep their nurseries free of insect pests and

diseases and to supply plants of reliable parentage. But in actual practice many nurserymen not only charged excessive prices (i.e., Rs. 1/8/- Rs. 2/8/- or even more per plant of Blood-Red orange), but in many cases the plants turned out to be of inferior varieties, and the department was not in a position to vouchsafe the pedigree of these nursery plants as they were not invariably produced under their direct supervision. Thus apart from the growing feeling of uncertainty about the origin of stock produced by the private nurserymen on the approved list of the department, the rates charged were so high that these could be paid for, only by the rich people, and the problem of the petty zamindar still baffled the Department of Agriculture. Besides this, the grower had to choose between the plants of good lineage at high rates on the one hand, and those of poor lineage at cheap rates on the other. Not infrequently therefore the grower, especially the illiterate, would buy the cheap stuff offered by unreliable and reckless nurserymen without realising that cheap plants may prove very costly in the long run.

Under these circumstances, the department, though, in the beginning not in favour of opening the government nurseries, lest they affect adversely the private enterprise, ultimately decided to start a number of them at different places in the province in order to supply reliable plants at reasonably cheap rates, so that they may be within the reach of even poor people, who may not be tempted to purchase cheap plants from unreliable nurserymen. This scheme was made possible through the Government

of India Rural Reconstruction grant of Rs. 47,000/-, made in September, 1935. The small nursery already existing at Lyallpur was considerably extended, and several more were established. They are now serving the particular districts noted against each, as under :

1. **Lyallpur.**
for Lyallpur, Sheikhupura and Jhang.
2. **Muzaffargarh.**
for Multan, Muzaffargarh and Dera Ghazi Khan.
3. **Sargodha.**
for Sargodha, Mianwali, Gujrat, Campbellpore, Jhelum and Rawalpindi.
4. **Gurdaspur & 5. Gujranwala.**
for Gurdaspur, Sialkot, Gujranwala and Amritsar.
6. **Jullundur.**
for Jullundur, Hoshiarpur, Ludhiana, Ferozepore, and Kangra.
7. **Karnal.**
for Karnal, Rohtak, Gurgaon and Ambala.
8. **Montgomery**
for Montgomery, and Lahore.
9. **Samli (on 'Pindi-Murree Road).**
for producing Hill fruit plants for hilly tracts of the province.

This arrangement saves the purchasers of plants from paying heavy freight charges and at the same time there is less risk of damage to plants in transit.

The results of the extension of government nurseries have been very encouraging, and the number of fruit plants supplied, has been increasing year by year; viz., 6,699 in 1935-36, 20,865 in 1936-37, 34,138 in 1937-38 and 39,061 in 1938-39.

The Lyallpur nursery alone has been responsible for supplying one-half to one-third of the total number of plants sold from all government nurseries in the province, each year. All departmental nurseries are treated as one unit, so that the required number of budders and necessary amount of budwood can be sent at budding seasons to various nurseries depending upon the stock fit for budding at each place. The services of these budders are also utilized in off seasons for other miscellaneous work—experimental and demonstration work, topworking of 'ber' trees, etc. About fifty thousand wild 'ber' trees scattered all over the Province have been topworked to better varieties during the last few years.

The demand on the government nurseries for supply of plants, owing to their genuineness and cheap prices, is usually many times higher than the stock available, but year by year the production is being increased, and it is expected that next year about $\frac{3}{4}$ th of sixty thousand plants would be fit for sale.

With the proposed enhanced supply of water for fruit gardens by the government, the demand for fruit plants is expected to increase still further. The production is, however, being increased simultaneously and a very large step, as detailed below, being taken this year by the Lyallpur Nursery alone, is worthy of note.

2 maunds and 35 seers of *khatti* seed extracted from 90,000 *khatti* fruits was sown during monsoon, 1939, for raising *khatti* seedlings. This seed is expected to yield about one million seedlings, which will be ready for transplanting during monsoon 1940, and fit for budding over with *malta*, *sangtra*, grape fruit, *kaghzi nimboo*, etc., in 1941, and for supply to the public in 1942.

Over one hundred thousand *khatti* seedlings have been transplanted during monsoon 1939, and will be ready for budding in monsoon 1940 and supply to the public in 1941. It is hoped that this large number of stock seedlings, when budded, will go a long way to meet the demand of the prospective fruit growers.

50,000 mango stones were sown during monsoon, 1939 to raise stock seedlings for taking grafts from mango trees of outstanding merit.

2½ mds. of peach seed has been sown for raising stock seedlings for budding over with plums, peaches and almonds, etc.

Similarly, work at other nurseries is being extended. About one hundred thousand plants of different kinds of fruit trees have been budded or grafted during spring and monsoon 1939 at various government nurseries in the province. Out of the total number of plants thus budded or grafted, 48,246 plants, i.e. almost one-half of the total number, were budded or grafted at Lyallpur nursery alone.

About 63,000 plants are expected to be fit for budding or grafting during the 1940 spring.

To meet a very heavy demand for grafted mango plants from all over the province, in addition to the grafts being taken at the government nurseries, a considerable number of grafts have been arranged from Brij Lal Orchards, Pathankot and such other places. In these places grafts are detached from the parent trees of approved quality in the presence of a departmental officer, and these are then marked and labelled as such.

To enable small cultivators to purchase plants from government nurseries, the prices of nursery plants have been very much reduced as compared to the private nurseries. The current price-list of fruit plants sold from the government nurseries in the province is available from the Fruit Specialist, Lyallpur.

4. Production and Supply of Plants through the Punjab Fruit Development Board.—The latest scheme, which is fraught with the greatest potentialities, and which may render greatest possible service to the Punjab fruit industry, is the one that has recently been adopted by the Punjab Fruit Development Board at the instance of the Government Fruit Specialist. The scheme in a nutshell is this :

While 90% of the trees in old gardens are either poor yielders, or yield

fruit of very inferior quality, yet there are many trees, of almost every kind of fruit, existing here and there throughout the province, which are bearing bumper crops, and fruit of which is of as high a quality as found anywhere in the world. There are mango trees bearing fruit worth Rs. 100/- to Rs. 500/- each year, Malta trees bearing 500 to 1,000 fruits each, 'ber' trees of grafted varieties bearing 10-15 mds. of fruit each, and similarly trees of peaches, plums, apples, pears, 'amla,' etc., bearing profuse crops of excellent quality of fruit. A modern horticulturist is not any more contented with merely planting trees of any particular variety. He wants to go a step further, and produce plants from the best individual tree of outstanding merit of that particular variety. The Fruit Development Board, in co-operation with the District Fruit Growers' Associations and trading fruit growers, have therefore, decided to (a) make a survey of the existing orchards in the province, (b) mark out trees of outstanding merit, (c) arrange to secure budwood from these selected trees, and (d) produce in its own nurseries, the plants of pedigree stock for supply to its members. Half a dozen men for the present have been engaged, who, after necessary training under the Government Fruit Specialist, have started touring the province.



Top-working of "Bers," Wild Olives, and Other Inferior Fruit Varieties

by
S. S. Lal Singh, B.Sc. (Hons.), M.Sc. (Calif.),
Fruit Specialist, Punjab.

Top-working of "Bers."—Millions of "Ber" trees are found growing in an almost wild condition all over the province, which practically fetch no income to the owners. These are only good enough to supply brush wood for hedge purposes around the fields. With a view to convert these inferior trees into better ones (i.e., bearing fruit of superior quality which will add to the income of the Zamindar besides supplying him with some fruit to eat), "Ber" top working campaign was started some 4—5 years back and about 50,000 "Ber" trees all over the province have already been topworked. Budders with necessary amount of budwood of selected varieties in the Experimental Garden, Lyallpur are sent out from Lyallpur for this purpose and zamindars have not to incur any expenditure in this connection. This work has become so popular that many zamindars have learnt the art of top working and are now converting their wild "bers" into grafted ones. Mukaddams and beldars of the District Staff have also been trained in this work and last year they top-worked 5000 trees. Zamindars are advised to take advantage of this help that the Department renders gratis to them.

A leaflet describing the method of topworking ber trees can be had free from the Fruit Specialist, Punjab, Lyallpur.

Top-working of wild Olive Trees.—

A large tract in Murree hills is covered with wild olive trees known as 'Kahu'. This hardly brings any income. An interesting experiment is in progress to top-work (graft over) these trees with improved varieties of olives imported from Europe. Several hundred trees at different sites on the Murree-Pindi road have been top-worked (i.e. grafted over) which are making satisfactory growth. They are expected to bear fruit in 2½ years' time. If this experiment proves commercially successful, it will open up a vast scope for the cultivation of olives in so far as lacs of worthless Kahu trees can be grafted over to profitable varieties of olives. The fruit can be used both for pickling purposes as well as for oil extraction. India already imports a considerable quantity of olive oil which is sold at a fairly high price. Olive oil, it may be mentioned, is very largely used both in Europe and America for culinary purposes and it is considered very valuable for health.

Similarly fruit trees of inferior varieties of apples and pears in Simla hills have also been top-worked (grafted over) to better varieties with a considerable success. This work is done free of cost and zamindars possessing inferior fruit trees are advised to take advantage of this facility.

Progeny Garden, Risalewala

by

B. S. Mahngar, B.Sc. (Agri.), M.Sc.

(Idaho),

Agricultural Assistant, Fruit Section,

Lyallpur.

One of the greatest needs for the future success of the Punjab Fruit industry lies in the establishment of reliable nurseries from where plants of desirable varieties propagated from trees of outstanding merit on suitable root stocks could be supplied to the growers at reasonable rates. Formerly, the bud wood for budding citrus plants in Government nurseries at Lyallpur, was taken from a few trees of outstanding merit in the Government experimental gardens or from private gardens located at various places in the province where trees of good quality were selected and marked for the purpose. But owing to a considerable extension in the nurseries at Lyallpur and other places in the province, it had become a very difficult problem to secure enough bud wood from the few trees of good varieties, from the experimental garden at Lyallpur and from private nurseries for the reason that the removal of budwood in such a large quantity is inimical to the growth, productivity and the quality of the fruit. Moreover, the growers need the bud wood for raising plants for their own use from their trees of outstanding merit, which are found in a limited number in the gardens. In

order to overcome this difficulty of securing budwood in sufficient quantity and to ensure a continuous supply of the same from known trees of reliable parentage for raising fruit plants on such a large scale, a Progeny garden of twenty-eight acres has been planted at Risalewala Seed Farm in 1937-38 with selected varieties of fruit trees like Malta, Sangtra, Grape fruits, sweet limes, Kagzi lime, mangoes, dates, plums, peaches, etc. Plants, used here have been obtained from Government nurseries and from other private reliable sources. It would be interesting to mention that plants secured from private sources are the progeny of trees of outstanding merit, which have been winning prizes in the provincial Fruit Shows. It is gratifying to note that fruit trees in this garden are making very satisfactory growth and they will be big enough in 2—5 years' time, depending upon the kind of fruit, to supply the necessary amount of budwood for nursery propagation on a large scale.

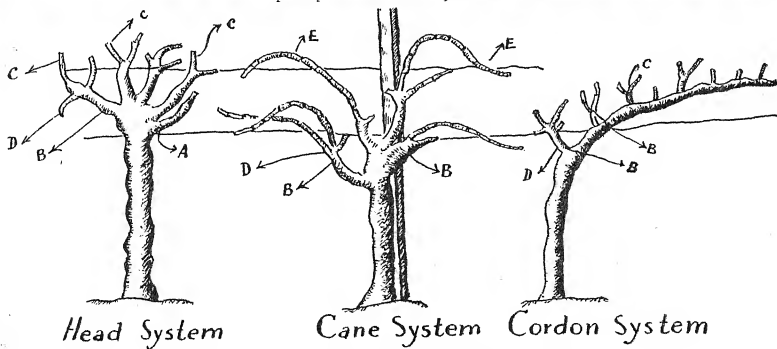
Another very pleasing feature of this garden is its system of inter-cropping which is being referred to, in a note on the inter-cropping of gardens.



A fine crop of berseem in the malta plantation at Resalewala.



A luxuriant crop of peas in the date plantation at Resalewala.



Different systems of training vines :

A, Head. B, Arm. C, Spurs. D, Replacing spurs. E, Cane.

Palampur Fruit Garden

by

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Lyallpur.

The district authorities of Kangra have been emphasising for a long time the necessity of encouraging the production of more fruits and vegetables in the district for local consumption with a view to balance the diet of the poor people there as the food is said to be extremely deficient in vitamin contents and which has resulted in the spread of several ailments.

From the point of view of climate (excessive rainfall and danger of hailstorms, etc.) the Kangra-Palampur Valley is not so suited for fruit production as Kulu and consequently both in regard to the quality and yield of fruits per tree, it would not be able to compete with Kulu. But Palampur has other advantages over Kulu in the form of nearness to railway station and proximity of good markets for the disposal of the fruits. If commercial fruit gardening proves successful it would be a boon to the locality as it would greatly improve the economic condition of the people. The area that can be brought under gardens in the locality is of course far greater than in Kulu. The suburbs of this locality provide elevations from 2,000 to 4,500 so that quite a variety of fruits like Peaches, Plums, Apricots, Almonds, Pomegranates, Loquats, Banana, Olives, Walnuts, Persimmons and even Pears and Apples

are likely to do well. At lower elevations citrus and mangoes would do well.

It was, therefore, decided that with a view to find out what kinds of fruits and what varieties of each fruit can be best grown in this locality that would stand competition with fruits grown elsewhere and also to encourage the production of fruits for local consumption which is the main problem of the locality and to push this ahead even though the quality of the fruit may not be absolutely first class, a large number of varieties of each kind of fruit were proposed to be tried. Varieties of the same fruit vary considerably in their climatic, soil and irrigation requirements and we can expect to find some good varieties that would do well there.

With this object in view an area of 25 acres was set apart from the Haily Nagar site at Palampur in November, 1936 and laid out immediately into 8 blocks and each block was divided into 2 halves by a central road passing over the top of the long ridge, comprising the garden area. Every block was then laid out into 7½ feet wide terraces and pits were dug up 15 feet apart in alternate rows. Before filling the pits, the condition of the subsoil of each pit was noted in a register and pits with unsuitable subsoil

were discarded. As the soil of the garden is very stiff, being of clay type, the pits were filled up with the surface soil mixed with 2 cubic feet of sand for each pit to improve drainage and aeration.

The kinds of fruit trees planted there are peaches, plums, almonds, apricots, nectarines, prunes, apples, pears, cherries, persimmons, chestnuts, walnuts, citrus fruits (malta, sangtra, grape fruit, sweet lime, kaghzi lime and lemons), stocks of all kinds and many other miscellaneous fruits like passion fruit, grapes, pomegranates, pistachionut, rose apple,

cashew nut, litchi, olive and berries of all kinds. The plants have been obtained from England, America, Japan, Palestine, Egypt, Kashmir, Quetta, N.W.F.P., U.P. and from departmental nurseries in the Province. The magnitude of the collection can be judged from the fact that no fewer than 230 varieties of different fruits have been collected. The collection includes early and late varieties with stocks resistant to various adverse conditions and may be expected to give a mine of useful information in due course.

Pir Sabz Plantation

by

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Canals are responsible for the water-logging of a good deal of area in the districts of Sialkot, Gujranwala Sheikhpura. Government are anxious for its reclamation and are spending a good deal of money on research work in this connection.

With a view to find out what hardy fruit trees or other economic plants can be grown successfully in these waste lands where the water table is within 2—3 ft. a preliminary experiment was laid in one acre of land acquired in Kotli Arain near Pir Sabz, District Sialkot, in March, 1933. Half the area was ridged by digging soil 2 ft. deep in alternate strips and putting it on the adjacent strips so that the ridges were 4 ft. high

from the base of the trench. The remaining half of the area was not trenched but the plants were planted on the flat.

'Kikar' (*Acacia arabica*), 'Falsa' (*Grewia asiatica*), Mulberry (*Morus alba*) Pears (*Pyrus sinensis*), Banana (*Musa sapientum*), 'Simal' (*Bombax malabaricum*), Willow (*Salix tetrasperma*), Mulberry Sujampur (*Morus alba*). 'Shisham' (*Dilbergia sisso*), 'Ber' (*Zizyphus jujube*) and eucalyptus were planted both on ridges and on flat in March, 1933.

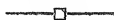
From the observations made up to November, 1937 it was found that Eucalyptus, 'Kikar' and 'Ber' had made a fair amount of growth on the ridges whereas no trees of any kind succeeded

on the flat land. 'Falsa' and Willow started well but later on dried up, most probably due to damage by cattle and lack of care.

These results indicated that this large area of waste land might profitably be utilized for the growing of some trees. Fruit Specialist, Punjab, Lyallpur then suggested that the experiment be conducted on a large scale so as to cover an area of about 15—20 acres and a couple of beldars should be appointed to look after the area. More kinds of trees as well as a number of grasses were suggested in the trial. The scheme costing Rs. 3,000/- and extending over a period of three years has been sanctioned by the Government and the experiment has been taken in hand.

The ridges now included in the experiment are 1½ ft., 1 ft. and 2 ft. high from the base of the trench. The ridges and trenches are 5 ft. wide. Every kind of plant included in the experiment is planted on ridges of different heights in the same row. The plants included in the trial are as follows :—

'Dhak'	(<i>Butea frondosa</i>)
'Kikar'	(<i>Acacia arabica</i>)
'Farash'	(<i>Tamari articulata</i>)
'Ber'	(<i>Zizyphus jujube</i>)
Willow	(<i>Salix tetrasperma</i>)
Weeping Willow	(<i>Salix babylonica</i>)
Mulberry	(<i>Morus alba</i>)
Paper mulberry	(<i>Broussonetia papyrifera</i>)
Swamp Mahogany	(<i>Encalyptus robusta</i>)
Red gum	(" <i>rostrata</i>)
Swamp gum	(" <i>rudis</i>)
Red gum	(" <i>tereticornis</i>)
'Shisham'	(<i>Dilbergia sissoo</i>)
'Bhan'	(<i>Populus euphratica</i>)
'Siris'	(<i>Albizia lebbek</i>)
'suhanjna'	(<i>Moringa pterygosperma</i>)
'Makhan'	(<i>Sapium sebiferum</i>)
'Kamila tree'	(<i>Mallotus philippinensis</i>)
Wild date palm	(<i>Phoenix sylvestris</i>)
Pilchi	(<i>Tamarix dioca</i>)
Broom grass	(<i>Thysanolaena Agrostis</i>)
'Kahi'	(<i>Sachcharum spontaneum</i>)
'Bhang'	(<i>Cannabis sativa</i>)
Castor	(<i>Ricinis communis</i>)
'Jamalgota'	(<i>Jatropha Curcas</i>)
'Bana'	(<i>Vitex negundo</i>)
'Sanatha'	(<i>Dodonea viscosa</i>)



Experimental Fruit Garden, Attari

by

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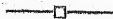
A 25-acre fruit garden has been planted in 1938-39 at Attari Government Farm. It is designed to carry, on field scale, some important experiments such as varietal and manurial trials on mangoes, citrus and grapes under conditions of the central Punjab. Although it is an experimental garden, yet it is stocked with only such varieties of fruits as have, more or less, already proved successful in the Punjab; so that for practical purposes it may be considered a commercial garden, and public may get an idea of the actual yield of fruits from various varieties, as well as an idea of the income and expenditure of a commercial orchard.

Another interesting feature of this garden is that, unlike the general practice in the Punjab, of budding the malta plants in the nursery and then planting the budded plants in the garden, the plants in this garden were budded *in situ* i.e. seedlings of rough lemon (khatti), obtained from the seeds of a single tree were planted directly in the garden in their permanent places and were sub-

sequently budded there to five best varieties of malta oranges; four of grape fruit and five of sangtra orange. In budding also, care was taken to get budwood from a single tree of each variety so that all the plants of any particular variety are absolutely uniform in regard to both stock and scion and age. Budding *in situ* is probably the first trial in the Punjab on any large scale. Plants budded over in this way, have made remarkably good growth in a short time.

Besides citrus, nine promising varieties of grapes, fourteen of grafted mangoes and about ten best strains of Blood-red oranges are represented in the garden, in addition to several types of wind breaks and other miscellaneous fruits which should also serve as a demonstration to prospective fruit growers of the locality.

Another important economic aspect, with respect to inter-cropping of the garden is also worth-mentioning which is discussed under intercrops for gardens.



Climatology of the Punjab Fruits

by

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1. **Climatic requirements** :—In every horticulturally advanced country of the world, the usual rule is to grow in a locality only those kinds of fruits that are best suited for it, with the result that there are well defined tracts for particular fruits. In the Punjab, however, there is a general tendency to plant in one's garden, even of a small size, many kinds, of fruit, though some of them do not suit the place. This not only lowers the quality of fruit but greatly reduces the income from the garden. In order to enable the reader to judge for himself the kind of fruits that he should grow in any particular locality, it seems advisable to give here the climatic requirements of some of the important fruit trees grown in the Province. It must, however, be emphasised that the subject is a very intricate one as varieties of any one kind of fruit can grow in a very wide range of climate and this article is meant to give a very general idea to the readers.

2. **Apples, Pears, Cherries, Walnuts, and Persimmons** are grown only on high elevations (4,000—7,500 ft.) of the Himalayan region, the chief centres being the Kulu valley, the Simla hills and Kotgarh, the Muree hills, and Dalhousie. Hail storms, however, are a great obstacle in the growing of these fruits and the amount of fruit produced every

year is largely determined by the severity and frequency of the hail storms. Dharamsala, Dalhousie, and the Muree and Simla hills are more affected by hail storms and excessive rainfall than the Kulu valley, and Kotgarh, which being protected on all sides by high hills, are practically free from frost. Of all fruits, apples perhaps require the coolest climate. Some of the best varieties of apple such as Baldwin, Cox's Orange Pippin, Delicious etc, are grown to perfection in the Kulu valley and at Kotgarh at elevations of 5000 to 7000 ft. It may, however, be mentioned that a variety of crab apple, of the size of a big plum and of inferior flavour and slightly coarse texture, is found growing extensively even in the hot and arid plains of Lyallpur, Multan and Muzaffargarh Districts. This variety has been found to be a prolific bearer and finds ready and profitable market in the plains, generally amongst poor class of people. The growing of Cherries and Walnuts also is at present restricted only to the Himalayan regions, although it is possible that California Walnuts of placencia type may be successful even in sub montane tracts. Extensive plantations of Walnuts are not at present owned by many fruit growers, although a few trees are planted by every one in his orchard. Apart from some

good varieties of cherry grown at Manali (6000 ft.) and some near Kulu (about 4500 ft. elevation), some excellent varieties like Early Rivers, Governor Wood, White Bigarreaus, Monstreuses de Mazel, etc., have been found growing at Mashobra (Simla Hills, elevation about 7000 ft.). Pears of poor quality, known as "Pathar Nakh," have been increasingly planted in recent years in the plains, but neither of these varieties can compare in quality with the choicest varieties like Bartlett, Doyenne du comice, Clapp's Favourite, Easter Burre, etc, grown in Kulu and the Simla Hills. Some excellent imported Japanese varieties of Persimmons are being grown successfully in the Kulu valley at an elevation of about 4500 feet also near Pathan-Kot (1000 ft.). A few trees of this fruit have also been successfully grown in recent years at Jullundur.

3. Peaches, Plums, Apricots, and Almonds are all deciduous fruits, and good varieties of these prefer a warmer region than the group of fruits mentioned above and a cooler region than Citrus and Mangoes for their success. They are best suited for sub-montane tracts preferably 1500 to 3000 ft.

Almond is very little grown in the Punjab at present. It is largely imported from Baluchistan (Quetta) Kabul (Kandhar) Kashmir and N.W.F.P. It prefers cool climate but can grow even in dry tracts with comparatively less irrigation than that required for other fruits of this group. While it is true that some almond trees are found growing even in the warm plains of the Punjab, such as Lawrence Gardens Lahore, in places protected against hot dry winds but the yield and quality of fruit is only

moderate at its best. Its cultivation on a commercial scale can not therefore be recommended at present in the warm plains of the Punjab. This fruit seems to thrive very well at Dalwal near Choa Saidan Shah (Jhelum Distt.) as well as in some places like Sodhi in Shahpur District. In fact the whole salt range wherever soil is good and irrigation facilities exist and localities are not too much exposed to hot dry winds, can be considered very suitable for the cultivation of almond on commercial scale. Its cultivation should be encouraged as this province imports lacs of rupees worth of almond from outside.

(b) Apricots of very good quality are grown in Haripur (N.W.F.P.) where the climate is mild. Trees of an inferior variety of apricot, locally known as "Hari" growing scattered in large numbers are met with in the lower parts of the Murree hills, parts of Rawalpindi and Jhelum Districts, particularly near about Choa Saidan Shah and in the salt range of Shahpur District. Some trees of large size bear as much as 5-15 maunds of fruit each per year. Near about Lyallpur, a few trees of apricot are found growing to handsome size but seldom bear any crop. If, however, they are thoroughly protected on all sides against hot dry winds, they may bear a small amount of crop of ordinary quality. On the other hand, in slightly cooler tracts, and in sheltered localities, such as around Shahdara (near Lahore) on the banks of the Ravi and some parts of Gurdaspur, they seem to be doing slightly better. Apricots cannot be a paying crop in the warm plains of the Punjab but may do quite well in cooler sections of the province.

(c) Peaches and plums require a relatively cooler climate. There is no doubt that a flat variety of peach known as "Chakli" as well as another hardy variety, locally known as "Noaki," are found growing all over the plains, including the hot canal colonies of Lyallpur and Montgomery. A considerable number of excellent imported varieties of Peaches and Plums are being grown in a garden in Shahdara which bear a heavy crop of excellent fruit. Here again, the high quality and bearing are due to very effective shelter against hot and dry winds. The proximity of the river and protection on all sides by the thick growth of trees, an abundant supply of water, close planting, and a rich alluvial soil have all contributed to the success of these fruits. Even in Lyallpur, where summer is very hot and dry, some imported varieties, like Plum Red also appear to be promising, provided they are well protected against winds. Usually the country varieties of plum called "alucha" is grown in most places.

(d) It will be safe to say that good varieties of apricot, almond, and peach can be grown only in fairly cool localities. Plum also requires a cool climate, but it can be grown successfully even in somewhat warm places, provided the plantation is protected from hot and dry winds, and there is ample supply of water.

4. **Mango.** It is definitely a tropical or sub-tropical fruit and is extremely susceptible to frost. During severe frosts, occurring off and on, most of the young and unprotected mango plants usually die and the branches of even old trees are killed. Of course, some of the varieties like Langra Hardowi, Malda

(Bombay Green), Krishan Bhog, etc., are relatively more resistant than other grafted varieties, yet the fact remains that frost militates against the success of mango growing. Mango can adapt itself to a variety of conditions. Although the greatest area under mangoes in the Punjab is found in the sub-montane tracts of Hoshiarpur, Ambala, Karnal, Gurdaspur Sialkot, etc, yet there are some mango trees in Muzaffargarh district, known as Mohammadwala, Butaputi, etc which bear fruit worth Rs. 100/- to Rs. 500/- each per year, while the indigenous varieties of mangoes of Shujabad in Multan district have established a name throughout the province for yield and quality. This phenomenal success in Multan and Muzaffargarh is largely due to the proximity of rivers and shallow water table. In the Lyallpur Government garden, a few dozen plants of the Langra variety have been fully established and are yielding excellent crop. But it must be emphasized that growing of grafted mangoes in canal colonies (Lyallpur and Montgomery etc.,) is an uphill task in so far as the young trees have to be protected in winter against frost and in summer against hot scorching winds. The study of mango growing tracts in other parts of India as well as abroad shows that the finest mangoes are grown only in tropical tracts entirely free from frost, but having plenty of moisture. It can thrive under varying conditions of rainfall and humidity, provided rain does not fall during the flowering season, for it interferes with pollination. Even moist weather or fog or excessive dew, during this time, spoils the flowers and prevents the setting of fruit. Mango has been known to grow in places with 10 inches

to 150 inches of rainfall per year.

Rainfall by itself is not an essential factor where irrigation facilities are available. High winds cause heavy dropping of fruits, and it is for this reason that the Punjab, which is frequented by heavy storms, is not suited for the growing of mangoes that bear very large-sized fruit. Although mangoes are found growing even at an elevation of 3000 feet or so in Kangra district, elevations of over 2000 feet are not congenial to this fruit. In short, the ideal conditions for mango appear to be, a tropical or sub-tropical tract with no rainfall, fog or dew during the flowering period; plenty of moisture either in the form of rain or preferably irrigation, and absolute freedom from frost and high winds.

5. Loquats. The loquat is a semi-tropical fruit and does best in places where the heat during summer is not excessive. Loquat requires a good deal of moisture in the soil and plenty of humidity in the atmosphere. Excessive heat or hot and dry winds are injurious to this fruit. Some of the best loquat orchards of Japan, which is very well known for this fruit are situated near large bodies of water. In the Punjab some loquat trees are found growing in almost every important garden in the vicinity of big towns like Amritsar and Lahore and even in the hot canal colonies. In the plains, the success of loquat growing largely depends upon the protection afforded to it against hot dry winds during summer, and the supply of water. The best home for this fruit appears to be a relatively cool tract at an elevation of about 2000 feet or so.

6. Citrus fruits, such as, *malta*, *sangtra*, lemons, sweet and sour limes, pomeloes, *galgals*, etc.

Excellent citrus gardens are found in a very wide range of climates. Some excellent gardens of these fruits are found in sub-montane tracts, like Sialkot and the Indpur and Indaura tract of Curdaspur, as well as in the hot, dry plains of Sargodha, Gujranwala, Montgomery, Multan and Muzaffargarh. Although a few trees are seen growing even in the hills, their fruit is of poor quality. It is not possible to grow them in such cold regions. An extremely hot climate also is not relished by citrus. While the trees grow fairly luxuriantly in hot regions, the fruit is considerably injured. Citrus fruits, particularly *sangtra*, get scorched by the direct rays of the sun, especially on the South and South-West side of the tree. The side of the fruit, exposed to direct rays of the sun, does not grow so rapidly as the healthy portion and becomes dwarfed, resulting in malformation. The skin adheres tightly to the flesh and dries up entirely producing black spots. In several of the gardens in the hot canal colonies, the major portion of the fruit on the South-West side is found sunburnt. This lowers the market value of the fruit. Strong, hot and dry winds cause considerable dropping of fruit in summer. Unless the gardens are well protected against these winds, much loss is bound to occur annually. Detailed observations of the Citrus gardens of the Province also reveal that *sangtra* prefers a slightly cooler climate than *malta* and cannot tolerate heat and low humidity so well as *malta* appears to do. It is probably because of this that we find a greater tendency among people to grow

sangtra in sub-montane districts, while in canal colonies *malta* is preferred.

Occasional frost in winter is not, on the whole, a great obstacle to the growing of Citrus trees. Among the various kinds of Citrus, however, *Kaghzi Nimboo* (Sour Lime) is decidedly most susceptible to frost. Given the same conditions, Citrus trees appear to resist frost in the following order, '*sangtra*,' '*khatta*,' '*Malta*,' pomelo, grape fruit, citron, '*mitha*' or sweet lime, and '*kaghzi nimboo*'. The experience of last few years' frost indicates that mature citrus trees, on the whole, survive frost attack fairly well, except *kaghzi nimboo*, which is injured to a certain extent.

7. *Grape*.—It is a plant that can grow and fruit under varied climatic condition, from the hot plains up to an elevation of 6000 feet or so, provided there is no excessive rainfall either at the flowering or at the ripening time. Excessive heat, however, appears to have a tendency to promote thicker skin on the fruit. Since monsoon rains fall in early July, only the early varieties have any chance of success. Grapes have not so far been extensively grown in the province. With the exception of the vine yard of Mr. Mitchell of Renala Khurd, who has about 50 acres or so under this fruit, there is perhaps no other extensive vineyard. Of course, there are a few scattered patches of Grape vines, in almost every garden. Wherever they have been grown, they have put on luxuriant growth and yielded heavy crops, but the quality has not been good. The trials carried out at Lyallpur during the last 8-9 years, on over a hundred varieties of grapes imported from California,

Australia, South Africa, various parts of India, give indication of some promising varieties as regards yield, quality and early ripening.

8. *Guava*.—It is not an important fruit crop of the Punjab, but, excepting the high altitude of the Himalayas, it grows practically in all parts of the province. It can grow under both tropical and sub-tropical climates. Severe frost, however, injures young plants of guava to a considerable extent. Even full grown trees are injured, when the temperature goes down to about 28°F. On the whole, excellent guava trees can be grown in plains of the Punjab as well as in the sub-montane tracts, provided sufficient care is taken to shelter the trees against frost and cold winds, particularly in their first 2 or 3 years of growth and there is abundant supply of moisture in the soil.

9. *Bananas*.—With the exception of the suburbs of Amritsar, where it was once commercially cultivated, banana is grown only on small patches of land, scattered all over the province. Since the quality of fruit produced at Amritsar was far inferior to that of the imported stuff, its cultivation has greatly declined. Although large banana growing tracts of the world, viz. Hawaiian islands, Malaya States, Ceylon and parts of Bombay, Bengal and Madras Presidencies etc. indicate that the most ideal conditions for growing Banana are a humid and relatively hot climate, rich soil, plenty of irrigation, and freedom from frost, yet some good varieties of banana are also found growing in cooler tracts of high elevations, as Niligris and Kodaikanal in Madras Presidency. Being purely an

ever-green plant, it does not appear to thrive well under a fairly long Punjab winter, with occasional occurrence of frost and the prevalence of hot and dry winds in summer. An effort is, however, being made to find out some suitable hardy varieties for the Punjab.

10 Pomegranate.—It is a tropical and sub-tropical fruit and, therefore, occurs practically all over the Province. Wild varieties of no value are found growing in several of the low hills of the outer Himalayan ranges, even as far as Simla. The best fruit in the province is produced in places like Alipur, in Muzaffargarh district, and parts of Multan where the climate is very hot and humid during the ripening season. Pomegranate requires a regular supply of moisture; unevenness of irrigation particularly in summer, frequent hot dry winds, and lack of proper drainage are alleged to be responsible, to a certain extent, for the splitting of fruit which is reported from a large number of gardens in the province. It appears that wherever the orchards are well protected against hot dry winds and are near large bodies of water, which prevent rapid changes in the atmospheric humidity, this trouble is not serious.

11. Jujube (Ber).—It is one of the most extensively grown wild fruit trees of the Punjab. It is very hardy and can stand extremes of heat and cold. It enjoys the long summer heat of the plains and does well both in the arid tracts of the southern Punjab and in the relatively cool and humid portions of the sub-montane tracts. Clumps of wild ber locally known as "Malha Ber" (*Ziziphus Numularia*) and "Tree" Ber

(*Ziziphus jujube*) form a general feature of the broken hilly country of Rawalpindi and Jhelum districts, where the only means of moisture supply is rain. In the plain districts, ber trees are to be found practically round every village, growing under the most neglected conditions possible. Extensive trials on top-working thousands of wild ber trees with a view to convert them to better varieties, have given very encouraging results. In this connection reference may be made to the article on top-working ber trees. There is no doubt that in the improvement of this fruit lies a great field of valuable work. The cultivation of a hardy fruit like ber, which is not exacting in its climatic, water or soil requirements, needs encouragement in every district of the Province.

12. Dates.—Mr. Milne, to whom the credit is due for introducing the finest varieties of dates into the Punjab, remarks in his book on dates, "Date trees will grow lustily over a large portion of the Punjab but the successful cultivation of the crop may be limited to a comparatively small area, owing only to the fruits being damaged by rain in the ripening season." The usual proverb that 'date requires its head in fire and feet in water,' describes in a nut shell, its requirements in so far as it needs an extremely hot and dry climate, with plenty of moisture at its roots. It is a mistake, however, to imagine that it will grow even in water logged areas. The extension of the date cultivation in some districts is not possible merely because of the rains spoiling the fruit at the ripening stage. In Multan, Muzaffargarh and Dera Ghazi Khan districts, the finest varieties of dates are growing very

successfully; and, even at Lyallpur, the introduced Basra dates have proved very profitable. About 40 trees, planted along the road as an avenue, fetch an income of over Rs. 300/- per year. There is no doubt that the hot dry tracts of some of the canal colonies, like Lyallpur, Montgomery, Sheikhpura, Sargodha, etc., would also suit the cultivation of date. Out of the successfully introduced varieties, of dates, such as Hillawi, Khudrawi, Shamran and Zaidi, the first named is particularly suitable for cultivation, as it can be profitably marketed even in *doka* (uncured) condition.

13. Falsa.—It is grown in the plains as well as in the sub-montane districts of the Punjab. It is largely cultivated near Amritsar and Lahore but can be very successfully grown in the canal colonies also. It is a very hardy and drought resisting plant and can grow in almost any kind of soil with comparatively little irrigation. It thrives well and bears abundantly. Neither extreme heat nor dry winds injure the fruit or the tree. Even occasional frost is not a great menace to this fruit because, even if the tree is damaged above the soil, the plant readily gives out new shoots from below which bear abundantly in the succeeding spring.

As the Indian 'vaid's' and 'hakims' attribute some medicinal properties to the falsa juice, which also makes an excellent summer beverage, its cultivation may prove a source of good income, specially in soils that are unsuited for other fruit trees or even ordinary crops.

14. Fig.—It seems to do best at a place where the climate is hot and dry during the ripening season and which has

an annual rainfall exceeding 25 inches, in the absence of irrigation facilities. In this Province, however, canal irrigation, wherever available can be used if necessary to supplement insufficient rainfall. Fig can stand a fairly severe winter temperature. The climatic conditions of the greater part of the Punjab, as that of the canal colonies and the sub-montane districts are, therefore, suitable for fig culture. Even in the hills, fig grows luxuriantly and remains unaffected either by snow or frost, but the fruit fails to ripen well, owing to the rains that set in before the fruit is picked. Fig culture, however, has not appealed to the public in this province to any appreciable extent partly because of the inferior quality of fruit and partly because it spoils readily when ripe. If fig preserve and fig syrup, which are considered good laxatives, become popular, fig cultivation may receive an impetus.

15. Lichi.—It is rather a difficult crop to grow in the hot and arid plains of the Punjab. It is a tender, ever-green plant and requires for its success a well sheltered locality against hot and dry winds. In the Lawrence gardens, Lahore as well as in Amritsar Municipal gardens, Lichi has been grown in **well protected spots**, and the trees are yielding very good crop. Near Pathankot or at an elevation of about 2000 feet, it has been still more successful. It is rather exacting in cultural requirements and likes a moist atmosphere, abundant rainfall or very heavy irrigation, and freedom from frost. Lichi should grow well in the sub-montane regions of the Punjab.

16. Strawberry.—It is mainly cultivated in the higher elevations of the

Himalayas, where the cool climate of the hills tends to bring the fruits to perfection. Even in the sub-montane tracts, strawberry is grown to a more or less, limited scale, but the quality of fruit cannot be said to compare favourably with that produced in the hills. Around

Jullundur some good varieties of strawberry are grown, but lower down, in the hot districts of Lyallpur and Montgomery, this plant does not find a congenial tract, as the summer heat is too intense for it to produce fruit successfully.

CITRUS FRUITS

by

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from South Western side by growing 'Jantar' hedge near the trees, there should be no difficulty in establishing sangtra oranges even in hotter parts of the Province.

VARIETAL TRIALS

(a) **Malta Orange** :—There are about thirty varieties of this fruit under trial, some since 1928 and others 1931. These were obtained from various places in India such as Poona, Lahore, Agra, Gujranwala, Saharanpur, etc., and abroad such as Florida and South Africa. Besides these, eight more varieties have been obtained from California and Florida this year. There are also several strains of Blood Red variety of malta—mostly the progeny of such trees which were awarded prizes in the Provincial

Citrus Fruit Shows during the last few years.

The varieties planted in 1928 have been bearing a fairly good crop for the last five years and their yield records as well as quality tests have been maintained for this period and as a result of these, varieties selected for propagation and supply are, Excellencis, Pineapple, Vanille, Musambi, Jaffa, Dulcis, Seville and Valencia late and readers are referred to the Punjab Fruit Journal, October 1938, English Portion, and July 1938 Urdu portion. In addition to the above varieties, Callibrian Red, Ruby, and Blood Red Gujranwala, tried at Sargodha, have also proved very successful, besides several other strains of malta selected from that locality.

It may be mentioned that some fifteen years ago malta fruit was within the reach of only well-to-do people since it could not be had at less than As. -1|- to As. -1|6 each but now the fruit is within the reach of the average man in the street and sells at one to two pice each in season.

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Out of the varieties obtained from Nagpur and South Africa a couple of varieties such as Nagpuri and Natal tight skinned Naartjee are of good quality and the trees are carrying a good load of crop this year but it will be possible to say definitely about their yielding capacity in a couple of years more. Out of

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Lemons and Limes :—There are 14 varieties in all (names given in the appendix) out of which 11, imported from various places in India and abroad, are under trial since 1928 to 1931, one variety from Nagpur was added to the collection in 1934 and two varieties from U. S. A. have been planted in 1939. Out of the varieties planted in 1928 to 1931, European, Eureka, Villa Franca and Kaghzi lime—(a selected strain), have proved successful so far. Their brief description has already appeared in October, 1938 issue of the fruit journal.

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Quality Tests on Malta Orange :— In this connection observations on the

size of fruit amount of peel, rag and juice in the fruit, thickness of rind, number of seeds per fruit, sweetness and acidity of juice, etc., have been taken for the last five years and the results in the case of selected varieties are given in statement No. 4 which shows (1) Pineapple variety has got the least amount of peel and the amount of juice and its total soluble solids are the highest. It is an allround good variety except for greater number of seeds. (2) Next in quality come Excellencis, Vanielle and Seville, the fruits of which are from medium to big size, amount of juice is high, amount of rag is the least and total soluble solids are fairly high.

(3) Next come Jaffa, and Dulcis, fruit medium to big in size, amount of juice is fairly good, rind is also fairly thin, number of seeds per fruit is small and total soluble solids are quite good.

(4) Musambi, fruit medium to big, amount of juice quite good; rind medium in thickness; number of seeds per fruit the highest; total soluble solids (sugar) high and the acidity the least of all varieties. Sweetness and acidity are not well blended.

(5) Valencia late :—Size of fruit is the biggest; the amount of juice is moderate to low, amount of rag rather high, rind rather thick; amount of total soluble solids least of all and the acidity is the highest. The only point in its favour is that it is a late ripening variety. Its fruit ripens when all other varieties are picked and can fetch high price on this account.

Maturity Tests on Malta Oranges :— A knowledge about the time of maturity of fruits is very essential as it helps the

Statement No. 4 showing physio-chemical analysis of selected varieties of malta oranges from the year 1933-34 to 1937-38.

Serial No.	Name of variety.	Size of fruit in cms.	Percentage of whole fruit.			Thickness of rind in cms.	Average number of seeds per fruit.	Percentage of juice.		Solid acid ratio.
			Peel.	Rag.	Juice.			Total soluble solids.	Acidity.	
1	Fine-apple	22.2×22.5	27.6	21.6	49.8	.46	20	11.3	.68	16.6
2	Excellencis	23.3×23.1	32.5	17.8	49.2	.48	10	10.1	.52	19.4
3	Vanielle	23.6×23.6	30.4	19.9	46.8	.53	20	11.0	.75	14.7
4	Jaffa	23.5×24.03	32.5	22.1	44.6	.43	9	9.8	.66	14.8
5	Musambi	23.9×23.5	30.9	24.4	44.4	.5	22	10.4	.29	35.9
6	Seville	23.45×24.1	31.6	21.9	45.2	.47	12	10.6	.72	14.7
7	Valencia late	25.9×26.5	31.25	28.1	39.6	.58	4	8.8	.84	10.5
8	Dulcis	23.3×24.2	33.8	24.6	40.0	.51	8	9.4	.66	14.2

growers to place the fruit in the market at the time when it is fully mature. This information is especially helpful when the varieties grown, ripen at different times of the season so that, early, late and mid-season varieties can be arranged in groups for the purpose of picking their fruit at the right time.

For this purpose samples from different varieties were taken after every fortnight during the ripening season and analysed for total soluble solids and acid content. The results in the case of selected varieties from the year 1936-37 to 1938-39 are given in statement No. 5 which shows that the best picking season for the varieties in Lyallpur colony is as follows :

- (1) 1st fortnight of January.—Musaambi.
- (2) 2nd fortnight of January.—Excellentis Vanielle and Seville.
- (3) 1st fortnight of February.—Pineapple, Jaffa, Dulcis.
- (4) 2nd fortnight of February.—Dulcis, Valencia late.
- (5) 1st fortnight of March.—Valencia late.

BUD SELECTION—AN APPEAL TO FRUIT GROWERS FOR CO- OPERATION

Importance of Bud Selection cannot be over-emphasized. It has immensely raised the standard of fruit gardening in some foreign countries where Bud Selection Societies have been organized. Several articles specially devoted to this problem have already appeared in the Punjab Fruit Journal especially in the issues of April 1937 and October, 1938.

It is gratifying to note that at the suggestion of the Government Fruit Specialist, the Punjab Fruit Development Board has taken this work in hand. The Hon. Secretary has issued a letter to the fruit growers which is reproduced below.—

"You are aware of the fact that most of the fruit trees in our gardens are of inferior varieties and that they bear either very light crops or give fruits of very poor quality. It is for this reason that fruit gardens in India do not pay even one-fourth of what they do in foreign countries. Although 99% of our fruit trees are of inferior quality, yet we find quite a large number of trees, scattered about here and there, in various gardens, throughout the province, which bear heavy crops of fruit of good quality.

The only way to improve the standard of gardening in this country is to carry out a survey of all the gardens in the province and mark trees of outstanding merit, both in regard to yield and quality. When such trees are marked out, then arrangements can be made with the proprietors of such trees to secure budwood and take grafts from the same and supply such nursery plants to the fruit growers or the members of the fruit growers' associations. This work has been considered of highest importance in other countries with the result that almost every horticulturally advanced country has got bud selection societies to carry on this work. All the fruit growers and members of such societies agree among themselves to supply budwood or grafts from the trees (that may be selected for this purpose) at reasonable payments to the Bud Selection Society.

Statement No. 5 showing the mean results of fortnightly analysis of selected varieties of malta oranges during the ripening seasons of 1936-37 to 1938-39.

Serial No.	Name of Variety.	2nd fortnight of December.			1st fortnight of January.			1st fortnight of February.			2nd fortnight of February.			1st fortnight of March.		
		Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.
1	Pine-apple	9.7	.64	15.2	10.3	.61	16.9	10.3	.67	15.4	10.3	.52	19.4	11.3	.68	16.6
2	Excellencia	9.6	.74	13.0	10.1	.74	13.6	10.1	.52	19.4	9.9	.68	14.6	9.9	.68	14.6
3	Vanielle	10.0	.78	12.8	10.0	.71	14.1	11.0	.75	14.7	10.5	.79	13.3	9.7	.73	13.3
4	Jaffa	8.8	.68	12.9	9.1	.64	14.2	9.8	.73	13.4	9.8	.66	14.8	9.2	.65	14.2
5	Musambi	9.9	.3	33.0	10.4	.29	35.9	10.1	.3	33.7	10.2	.28	36.4	10.0	.28	35.7
6	Seville	9.0	.7	12.9	9.0	.71	12.7	10.6	.72	14.7	9.8	.66	15.0	9.6	.64	15.0
7	Valencia late	8.1	1.06	7.6	8.0	.95	8.4	8.0	.88	9.0	8.3	.85	9.8	8.7	.78	11.2
8	Dulcis	9.0	.68	13.2	8.9	.74	12.0	8.9	.71	12.5	9.4	.66	14.2	9.3	.63	14.8
														9.2	.74	12.4

which in turn propagates nursery plants and supply the same to the members. With this mutual co-operation, the growers or members of these associations find themselves in a position to plant trees of the highest quality.

There was a great necessity for such an organisation in the Punjab because a movement of this kind is bound to contribute more to raise the standard of fruit gardening than any other effort on the part of growers or the Government.

The Bud Selection Standing Committee of the Punjab P. C. Fruit Development Board has been considering this scheme for a long time and has studied the work carried on in other countries in this direction. You will be glad to know that the Board has decided to give a start to this scheme in the Province. A qualified staff, comprising a Bud Selection Supervisor (an experienced Graduate of the Punjab Agricultural College, Lyallpur) and five 'malis' has been appointed and trained in the work under the guidance of the Government Fruit Specialist at Lyallpur. They will be soon visiting important gardens in the Province for marking out trees of outstanding merit which might later on be used for further propagation of nursery plants.

As this movement is bound to benefit every fruit grower, taking part in it, and its success depends upon the amount of co-operation extended by the fruit growers, I have every hope that you will readily offer your co-operation in this beneficent movement and allow the Bud Selection Supervisor and his staff to examine fruit trees in your garden. In case, some trees are selected in your garden as of outstanding merit, I hope

you will have no objection to give to the Board, necessary amount of budwood; for which, of course, reasonable price will be paid to you. Besides this you will have the privilege to buy fruit plants produced from budwood of trees, similarly selected in other gardens all over the Province."

Experiments on budding of Citrus.—

This interesting experiment of practical importance was started in the year 1936. It is a common practice in Western countries, especially in America, to bud almost all plants without removing the piece of wood that remains attached to the bark (Scion bud) while removing the bud from the bud stock. This practice, is however, contrary to what is being done in India. The main advantages claimed by the "with wood" method are :—

1. Saving of time in removing the piece of wood from the bud before insertion.
2. Elimination of the danger of injuring the bud while removing the piece of wood.
3. Fruit plants like grape-fruit and Ber in which case the buds are associated with the presence of thorns, do better, if propagated by "With Wood" method.

RESULTS :—(1) The experiments carried out with four scion varieties show that the common Indian method of inserting the bud "without wood" attached to the bud-shield showed consistently higher percentage of success (25.5 % on an average) than the American method, i.e., "with wood" attached to the bud-shield.

2. With American method, however, the budder was able to bud about 25½ % more plants in the same time.

3. American method has also given better results when dealing with rather immature bud-wood than with mature bud-wood.

Propagating Kaghzi Nimboo by budding :—Kaghzi Nimboos, in the Punjab, are propagated from seed, which however, is not very desirable because they seldom come true to the parent trees. The plants produced from seed as a rule, considerably vary with regard to the quality and yield of crop borne by them. Other two methods commonly practised by the nurserymen for the multiplication of the most desirable strains and varieties of this fruit are layering (i.e., *dab*) and 'gootee,' 'Gootee' is not however so popular or successful in the Punjab as layering because its success requires humid climate, while the climate of the Punjab is dry except in sub-mountainous tracts. Layering is also tedious, expensive and wasteful and its practical utility is limited on account of the fact that (a) only a very small number of nursery plants can be produced from a given individual, (b) layerings have to be watered for a long period when still attached with the parent trees, (c) "gamlas" or earthen pots have to be used for layering and (d) some sort of wooden platforms are also needed for placing the "gamlas."

It is thus obvious that multiplication of the outstanding varieties of Kaghzi lime is a serious problem even to-day, and anything done in the direction of facilitating an easy and quick perpetuation of these varieties should prove a boon to our citrus industry. With this

aim in view, preliminary experiments on the propagation of Kaghzi lime, by budding on "khatti," were started in 1938 by the Fruit Section at Lyallpur. The results obtained were so encouraging as to leave little doubt about the efficacy of this method.

The method of budding is the same as of other citrus trees except that, while removing the bud shield for insertion into the stock plant, a small extremely thin slice of wood is also retained along with the bark. This is very essential because unlike sangtras, malta, and lemons, the buds in Kaghzi Nimboo (also grape fruit and sweet limes) are always associated with thorns and if wood is removed in this case, before the insertion of the bud, the bark is damaged with the result that the buds fail to unite.

Rejuvenation of Citrus Trees :—Throughout the province an enormous number of old citrus trees with dead or dry branches are met with in orchards. The results of trials show that, provided the bark of their trunks is green and in a healthy condition, such old trees can be easily brought back to a healthy state by severe heading back (i.e., cutting back) of their main branches white-washing the trunks and main limbs of be-headed trees to protect them against sunburn, and by subsequent heavy manuring with well rotten farm yard manure, mixed with about two seers of ammonium sulphate. For a detailed method of manuring see Departmental leaflet No. 109 : "Some Hints on Manuring of Citrus Trees."

Top working of citrus trees :—In many gardens in the Punjab, there are found, a very large number of 'khatta'

and 'Khatti' plants which fetch hardly any income. Besides 'khatta,' there are orange trees that are either shy bearers or bear fruit of very low quality. These can be top-worked by cutting back the tree at a height of 3-5 feet and budding the new shoots coming out from the trunk or from the main branches. For budding these trees, bud-wood should always be taken from such orange trees as are known to bear heavily, fruits of good quality. In order to prevent sun-burn to the trunk, which causes cracking of the bark, care should be taken to protect the trunk against the hot rays of the sun by white-washing the trunk or by wrapping it with paper or some kind of straw. For detailed instructions, for the protection of the bark of the trunk from sun-burn reference should be made to Departmental leaflet No. 51.

Fertilizer experiment with Malta Oranges :—No manurial work of any importance on citrus has so far been done in India. The problem is very important and deserves serious consideration, especially when the supply of farm yard manure is becoming acute, due to intensive farming and increasing area under fruit trees. To see whether we can partly or wholly replace this manure with an artificial fertilizer, an experiment was started in 1932 at Chak 45, G. B. Gojra, Lyallpur District, on full grown malta orange trees numbering 50 in all. This experiment was continued till 1937. Three doses of ammonium sulphate, i.e., 4 lbs., 8 lbs. and 12 lbs. per tree were tried. Application of the fertilizer was done twice annually by splitting the dose into two equal halves. The first-half of the dose each year was applied to the trees prior

to blossoming, i.e., in the third week of February and the second half in the middle of May. In 1936 due to appearance of mottle leaf on all the trees about 30 seers of farm yard manure per tree was applied in February in addition to the usual dose of ammonium sulphate. The results obtained are briefly given below.

Fertilized trees gave an increased yield over the trees which were not fertilized. The continued use of ammonium sulphate, without the addition of organic matter, i.e., farm yard manure in the soil, caused mottle leaf. Fertilizer in conjunction with farm yard manure gave an increased yield over the fertilizer alone. The most profitable dose was found to be of 4 lbs. as there was practically no difference between the yield obtained from trees treated with higher doses of the fertilizer. The size of the treated and untreated trees remained the same. Growth and fruiting was at the expense of one another during the same year, i.e., in one year of heavy fruiting, there was very little of vegetative growth and vice versa showing that excessive fruiting or excessive vegetative growth in any one year was not quite desirable.

Manurial Experiments on Malta at Fruit Farm, Montgomery :—With a view to determine the influence of various manures and fertilizers on the yield and vigour of malta oranges, 7 rows with 52 malta trees in each, were selected in a plot of about 8 acres. Out of these 186 trees of normal growth were marked for keeping the record. Different sets of trees were treated with (a) guara: (grown in the plot and buried as green manure in the basins);

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(4) Musambi, fruit medium to big, amount of juice quite good; rind medium in thickness; number of seeds per fruit the highest; total soluble solids (sugar) high and the acidity the least of all varieties. Sweetness and acidity are not well blended.

(5) Valencia late :—Size of fruit is the biggest; the amount of juice is moderate to low, amount of rag rather high, rind rather thick; amount of total soluble solids least of all and the acidity is the highest. The only point in its favour is that it is a late ripening variety. Its fruit ripens when all other varieties are picked and can fetch high price on this account.

Maturity Tests on Malta Oranges :—
A knowledge about the time of maturity of fruits is very essential as it helps the

Statement No. 4 showing physico-chemical analysis of selected varieties of mulla oranges from the year 1933-34 to 1937-38.

Serial No.	Name of variety.	Size of fruit in cms.	Percentage of whole fruit.			Thickness of rind in cms.	Average number of seeds per fruit.	Percentage of juice.		Solid acid ratio.
			Peel.	Rag.	Juice.			Total soluble solids.	Acidity.	
1	Pine-apple	22.2×22.5	27.6	21.6	49.8	.46	20	11.3	.68	16.6
2	Excellencis	23.3×23.1	32.5	17.8	49.2	.48	10	10.1	.52	19.4
3	Vanielle	23.6×23.6	30.4	19.9	46.8	.53	20	11.0	.75	14.7
4	Jaffa	23.5×24.03	32.5	22.1	44.6	.43	9	9.8	.66	14.8
5	Musambi	23.9×23.5	30.9	24.4	44.4	.5	22	10.4	.29	35.9
6	Seville	23.45×24.1	31.6	21.9	45.2	.47	12	10.6	.72	14.7
7	Valencia late	25.9×26.5	31.25	28.1	39.6	.58	4	8.8	.84	10.5
8	Dulcis	23.3×24.2	33.8	24.6	40.0	.51	8	9.4	.66	14.2

growers to place the fruit in the market at the time when it is fully mature. This information is especially helpful when the varieties grown, ripen at different times of the season so that, early, late and mid-season varieties can be arranged in groups for the purpose of picking their fruit at the right time.

For this purpose samples from different varieties were taken after every fortnight during the ripening season and analysed for total soluble solids and acid content. The results in the case of selected varieties from the year 1936-37 to 1938-39 are given in statement No. 5 which shows that the best picking season for the varieties in Lyallpur colony is as follows :

- (1) 1st fortnight of January.—Musaambi.
- (2) 2nd fortnight of January.—Excellencis Vanielle and Seville.
- (3) 1st fortnight of February.—Pineapple, Jaffa, Dulcis.
- (4) 2nd fortnight of February.—Dulcis, Valencia late.
- (5) 1st fortnight of March.—Valencia late.

BUD SELECTION—AN APPEAL TO FRUIT GROWERS FOR CO- OPERATION

Importance of Bud Selection cannot be over-emphasized. It has immensely raised the standard of fruit gardening in some foreign countries where Bud Selection Societies have been organized. Several articles specially devoted to this problem have already appeared in the Punjab Fruit Journal especially in the issues of April 1937 and October, 1938.

It is gratifying to note that at the suggestion of the Government Fruit Specialist, the Punjab Fruit Development Board has taken this work in hand. The Hon. Secretary has issued a letter to the fruit growers which is reproduced below.—

"You are aware of the fact that most of the fruit trees in our gardens are of inferior varieties and that they bear either very light crops or give fruits of very poor quality. It is for this reason that fruit gardens in India do not pay even one-fourth of what they do in foreign countries. Although 99% of our fruit trees are of inferior quality, yet we find quite a large number of trees, scattered about here and there, in various gardens, throughout the province, which bear heavy crops of fruit of good quality.

The only way to improve the standard of gardening in this country is to carry out a survey of all the gardens in the province and mark trees of outstanding merit, both in regard to yield and quality. When such trees are marked out, then arrangements can be made with the proprietors of such trees to secure budwood and take grafts from the same and supply such nursery plants to the fruit growers or the members of the fruit growers' associations. This work has been considered of highest importance in other countries with the result that almost every horticulturally advanced country has got bud selection societies to carry on this work. All the fruit growers and members of such societies agree among themselves to supply budwood or grafts from the trees (that may be selected for this purpose) at reasonable payments to the Bud Selection Society,

Statement No. 5 showing the mean results of fortnightly analysis of selected varieties of malta oranges during the ripening seasons of 1936-37 to 1938-39.

Serial No.	Name of Variety.	2nd fortnight of December.			1st fortnight of January			2nd fortnight of January			1st fortnight of February.			2nd fortnight of February.			1st fortnight of March.		
		Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.	Total soluble solids.	Acidity.	Solid acid ratio.
1	Fine-apple	9.7	.64	15.2	10.3	.61	16.9	10.3	.67	15.4	11.3	.68	16.6	10.7	.66	16.2	10.5	.67	15.7
2	Excellencia	9.6	.74	13.0	10.1	.74	13.6	10.1	.52	19.4	9.9	.68	14.6	9.4	.68	13.8	9.0	.69	13.0
3	Vantielle	10.0	.78	12.8	10.0	.71	14.1	11.0	.75	14.7	10.5	.79	13.3	9.7	.73	13.3	9.6	.81	11.9
4	Jaffa	8.8	.68	12.9	9.1	.64	14.2	9.8	.73	13.4	9.8	.66	14.8	9.2	.65	14.2	9.0	.71	12.7
5	Musambi	9.9	.3	33.0	10.4	.29	35.9	10.1	.3	33.7	10.2	.28	36.4	10.0	.28	35.7	9.4	.31	30.3
6	Seville	9.0	.7	12.9	9.0	.71	12.7	10.6	.72	14.7	9.8	.66	15.0	9.5	.64	15.0	9.3	.71	13.1
7	Valencia late	8.1	1.06	7.6	8.0	.95	8.4	8.0	.88	9.0	8.3	.85	9.8	8.7	.78	11.2	8.8	.84	10.5
8	Dulcis	9.0	.68	13.2	8.9	.74	12.0	8.9	.71	12.5	9.4	.66	14.2	9.3	.63	14.8	9.2	.74	12.4

which in turn propagates nursery plants and supply the same to the members. With this mutual co-operation, the growers or members of these associations find themselves in a position to plant trees of the highest quality.

There was a great necessity for such an organisation in the Punjab because a movement of this kind is bound to contribute more to raise the standard of fruit gardening than any other effort on the part of growers or the Government.

The Bud Selection Standing Committee of the Punjab P. C. Fruit Development Board has been considering this scheme for a long time and has studied the work carried on in other countries in this direction. You will be glad to know that the Board has decided to give a start to this scheme in the Province. A qualified staff, comprising a Bud Selection Supervisor (an experienced Graduate of the Punjab Agricultural College, Lyallpur) and five 'malis' has been appointed and trained in the work under the guidance of the Government Fruit Specialist at Lyallpur. They will be soon visiting important gardens in the Province for marking out trees of outstanding merit which might later on be used for further propagation of nursery plants.

As this movement is bound to benefit every fruit grower, taking part in it, and its success depends upon the amount of co-operation extended by the fruit growers, I have every hope that you will readily offer your co-operation in this beneficent movement and allow the Bud Selection Supervisor and his staff to examine fruit trees in your garden. In case, some trees are selected in your garden as of outstanding merit, I hope

you will have no objection to give to the Board, necessary amount of budwood; for which, of course, reasonable price will be paid to you. Besides this you will have the privilege to buy fruit plants produced from budwood of trees, similarly selected in other gardens all over the Province"

Experiments on budding of Citrus.—

This interesting experiment of practical importance was started in the year 1936. It is a common practice in Western countries, especially in America, to bud almost all plants without removing the piece of wood that remains attached to the bark (Scion bud) while removing the bud from the bud stock. This practice, is however, contrary to what is being done in India. The main advantages claimed by the "with wood" method are :—

1. Saving of time in removing the piece of wood from the bud before insertion.
2. Elimination of the danger of injuring the bud while removing the piece of wood.
3. Fruit plants like grape-fruit and Ber in which case the buds are associated with the presence of thorns, do better, if propagated by "With Wood" method.

RESULTS :—(1) The experiments carried out with four scion varieties show that the common Indian method of inserting the bud "without wood" attached to the bud-shield showed consistently higher percentage of success (25.5% on an average) than the American method, i.e., "with wood" attached to the bud-shield.

2. With American method, however, the budder was able to bud about 25½% more plants in the same time.

3. American method has also given better results when dealing with rather immature bud-wood than with mature bud-wood.

Propagating Kaghzi Nimboo by budding :—Kaghzi Nimboos, in the Punjab, are propagated from seed, which however, is not very desirable because they seldom come true to the parent trees. The plants produced from seed as a rule, considerably vary with regard to the quality and yield of crop borne by them. Other two methods commonly practised by the nurserymen for the multiplication of the most desirable strains and varieties of this fruit are layering (i.e., dab) and 'gootee,' 'Gootee' is not however so popular or successful in the Punjab as layering because its success requires humid climate, while the climate of the Punjab is dry except in sub-mountainous tracts. Layering is also tedious, expensive and wasteful and its practical utility is limited on account of the fact that (a) only a very small number of nursery plants can be produced from a given individual, (b) layerings have to be watered for a long period when still attached with the parent trees, (c) "gamlas" or earthen pots have to be used for layering and (d) some sort of wooden platforms are also needed for placing the "gamlas."

It is thus obvious that multiplication of the outstanding varieties of Kaghzi lime is a serious problem even to-day, and anything done in the direction of facilitating an easy and quick perpetuation of these varieties should prove a boon to our citrus industry. With this

aim in view, preliminary experiments on the propagation of Kaghzi lime, by budding on "khatti," were started in 1938 by the Fruit Section at Lyallpur. The results obtained were so encouraging as to leave little doubt about the efficacy of this method.

The method of budding is the same as of other citrus trees except that, while removing the bud shield for insertion into the stock plant, a small extremely thin slice of wood is also retained along with the bark. This is very essential because unlike sangtras, malta, and lemons, the buds in Kaghzi Nimboo (also grape fruit and sweet limes) are always associated with thorns and if wood is removed in this case, before the insertion of the bud, the bark is damaged with the result that the buds fail to unite.

Rejuvenation of Citrus Trees :—

Throughout the province an enormous number of old citrus trees with dead or dry branches are met with in orchards. The results of trials show that, provided the bark of their trunks is green and in a healthy condition, such old trees can be easily brought back to a healthy state by severe heading back (i.e., cutting back) of their main branches white-washing the trunks and main limbs of be-headed trees to protect them against sunburn, and by subsequent heavy manuring with well rotten farm yard manure, mixed with about two seers of ammonium sulphate. For a detailed method of manuring see Departmental leaflet No. 109 : "Some Hints on Manuring of Citrus Trees."

Top working of citrus trees :—

In many gardens in the Punjab, there are found, a very large number of 'khatta'

and 'Khatti' plants which fetch hardly any income. Besides 'khatta,' there are orange trees that are either shy bearers or bear fruit of very low quality. These can be top-worked by cutting back the tree at a height of 3-5 feet and budding the new shoots coming out from the trunk or from the main branches. For budding these trees, bud-wood should always be taken from such orange trees as are known to bear heavily, fruits of good quality. In order to prevent sun-burn to the trunk, which causes cracking of the bark, care should be taken to protect the trunk against the hot rays of the sun by white-washing the trunk or by wrapping it with paper or some kind of straw. For detailed instructions, for the protection of the bark of the trunk from sun-burn reference should be made to Departmental leaflet No. 51.

Fertilizer experiment with Malta Oranges :—No manurial work of any importance on citrus has so far been done in India. The problem is very important and deserves serious consideration, especially when the supply of farm yard manure is becoming acute, due to intensive farming and increasing area under fruit trees. To see whether we can partly or wholly replace this manure with an artificial fertilizer, an experiment was started in 1932 at Chak 45, G. B. Gojra, Lyallpur District, on full grown malta orange trees numbering 50 in all. This experiment was continued till 1937. Three doses of ammonium sulphate, i.e., 4 lbs., 8 lbs. and 12 lbs. per tree were tried. Application of the fertilizer was done twice annually by splitting the dose into two equal halves. The first-half of the dose each year was applied to the trees prior

to blossoming, i.e., in the third week of February and the second half in the middle of May. In 1936 due to appearance of mottle leaf on all the trees about 30 seers of farm yard manure per tree was applied in February in addition to the usual dose of ammonium sulphate. The results obtained are briefly given below.

Fertilized trees gave an increased yield over the trees which were not fertilized. The continued use of ammonium sulphate, without the addition of organic matter, i.e., farm yard manure in the soil, caused mottle leaf. Fertilizer in conjunction with farm yard manure gave an increased yield over the fertilizer alone. The most profitable dose was found to be of 4 lbs. as there was practically no difference between the yield obtained from trees treated with higher doses of the fertilizer. The size of the treated and untreated trees remained the same. Growth and fruiting was at the expense of one another during the same year, i.e., in one year of heavy fruiting, there was very little of vegetative growth and vice versa showing that excessive fruiting or excessive vegetative growth in any one year was not quite desirable.

Manurial Experiments on Malta at Fruit Farm, Montgomery:—With a view to determine the influence of various manures and fertilizers on the yield and vigour of malta oranges, 7 rows with 52 malta trees in each, were selected in a plot of about 8 acres. Out of these 186 trees of normal growth were marked for keeping the record. Different sets of trees were treated with (a) guara: (grown in the plot and buried as green manure in the basins);

(b) farm yard manure : (one maund) each tree;

(c) ammonium sulphate: 3 lbs. each tree;

(d) sodium nitrate: 4 lbs. each tree;

(e) ammonium sulphate: 1½ lbs. plus farm yard manure half maund;

(f) sodium nitrate: 2 lbs. plus farm yard manure half maund each tree.

The results have shown, firstly that the fertilizers gave higher average yields over the unfertilized trees and secondly the highest increase in yield was obtained when artificial nitrogenous fertilizers, viz., ammonium sulphate and sodium nitrate were applied in conjunction with farmyard manure.

Root-Pruning of Oranges (Sangtras):

Root-pruning of certain fruit trees is an established orchard practice throughout Bombay Presidency and some parts of Central India. Even in the Punjab there is a large class of fruit growers who believe in the efficacy of exposing and pruning the roots of citrus trees like Malta, sangtras, lemons and sweet limes. The climate and soil of the Punjab being quite different from that of Bombay the system of root pruning as practised by Bombay growers, cannot possibly be employed here in its entirety.

In order to find out the effect of root-pruning on the vigour and productivity of citrus trees, a preliminary experiment was carried out for 3 years on apparently uniformly vigorous trees of over 10 years of age which had attained very big size but had persistently failed to bear any crop. In all 56 trees, including those left

untreated for comparison, were taken. The soil around the trunk was dug out in a ring, leaving one foot of soil around the trunk untouched. The width of the ring of soil dug was 3 feet in diameter with a depth of 9" in the case of light root-pruned trees, 12" in medium root-pruned and 15" in the heavy root-pruned. The fibrous roots in the dug out portion of the soil were then removed. The trees were left in this condition for a week, after which the pits were covered with soil, well mixed with 3 maunds of farmyard manure per tree. The same quantity of manure was applied to the untreated trees also, but this was merely hoed in around the trees with a spade. All trees were then watered and no further watering was done till the fruit had set.

Similar operations were carried out subsequently for 3 years with slight modifications in this garden and in two other gardens in Lyallpur and Montgomery.

CONCLUSIONS

The results of the experiment indicate that, although in general, root-pruning does increase the yield of healthy trees, it has an adverse effect on their vigour. Consequently it should be practised only on such trees as make excessive vegetative growth but bear very little fruit. In such cases light-pruning is beneficial.

Ringling of Sangtra (Oranges) at Chak No. 45 G. B.:—This experiment was started in 1932 and repeated in 1933 and 1934 with the object of finding how far the yield of sangtra trees could be increased by ringling. Different systems of ringling the trunk of the tree were tried on two different occasions; and the

rings, excepting a few left as control, were covered with different kinds of bandages such as surgical adhesive tape, electric insulating tape and graftax, while some of the ringed trees were applied a thin coating of white lead paint. The trees in general had been shy bearers and were about 10 years old. In the case of a few trees, only certain limbs were ringed and others left as such for comparison in order to see if ringed and unringed limbs on the same tree behave differently from one another. The main conclusions drawn from this experiment are :—

1. Covering of wounds is essential for proper healing.
2. Ringing has given invariably higher yield per tree than the control.
3. No significant difference in size and yield of the fruit was found in the trees ringed by various methods, viz., Halma, Swarbrick and Gardner:—
 - (a) Halma method.—Complete knife incision all round the trunk of the trees.
 - (b) Swarbrick method.—Complete ring of .5 c.m. width all round the trunk of the tree.
 - (c) Gardner method.—Two semi-circular rings, of .5 c.m. width, each ring at a distance of 4 in. from each other, and running in opposite direction to only $\frac{1}{2}$ round the trunk of the tree.
4. Ringed limbs have definitely given higher yield than unringed ones on the same tree.
5. Size of fruit on ringed limbs was bigger than those on the unringed limbs.
6. No definite conclusions regarding the effect of different methods of ringing on the vigour of trees could be drawn from the girth measurement records as the differences in the girth measurements of ringed and unringed trees were insignificant.

Electro Culture of Citrus Trees :

Dr. S. S. Nehru reported that artificial electrical energy applied to shy-bearing unhealthy fruit trees at several places resulted in their fruitfulness and improved growth. To test the efficacy of this cultural practice a preliminary experiment has been started in 1939 at Brij Lal Orchards, Pathankot on shy-bearing, otherwise healthy 'sangtra' (orange) trees. The method consists in treating the trees with electric energy derived from an ordinary battery. The current is passed through a small induction coil so that a $\frac{1}{4}$ inch spark, between the two terminals, is obtained. This spark is allowed to pass between the wire netting attached to the plant in the form of a jacket or collar.

The yield records of the trees thus treated are being taken and the results would be available in due course.

Sun-burn on Malta and Sangtra (Oranges) :—Sun-burn on citrus fruits is very common in almost all the orchards. Young orchards are more severely affected than the grown up ones, as they are more exposed to direct rays of the sun. In order to know the extent of damage from sun-burn and find out some remedy of the same, observations on Malta and Sangtra trees were made for two seasons, viz., 1937 and 1938. In the case of Malta trees under observation, a set of 18 trees was in the open and the corresponding number

protected by means of "Jantar" (*Sasbania Egyptica*) grown on the south-west side of the trees. The total number of fruits as well as the number affected on each aspect, viz., North-East, South-East, South-West and North-West were counted on the trees under experiment for two seasons. Similar observations were taken in the case of Sangtra trees with the only difference that the number of trees under observation was about one-third of that of Malta oranges. It has been found out that (1) the greatest damage occurs on the South Western side, which should be expected normally, as the rays of the sun are more intense on this side.

(2) That by providing shade on the South-Western side by planting 'Jantar' damage has been reduced to 50% in malta oranges and about 75% in sangtra oranges.

Packing of Citrus Plants :—Citrus trees are being planted in the Punjab on a large scale. As a general rule, the nursery men in the Punjab dig out the plants with balls of earth around their roots, wrap the same with grass, banana leaves or gunny bag, and then pack 4 to 6 plants in each basket or box. Such a package necessarily becomes very heavy and consequently involves heavy expense on freight charges especially when the plants are transported over long distance.

In order to see how far this system can be improved upon, 3 trials were carried out at Lyallpur for two seasons.

Seventy-two $1\frac{1}{2}$ years old, healthy plants of malta oranges of apparently uniform vigour and size were selected for these trials and packed by the following three methods:

1. Twenty four plants dug out with earth balls wrapped with gunny bags and packed in baskets as is generally practised in the Punjab.

2. Twenty-four plants were dug with earth balls. The soil was completely washed off by immersion in water. The roots were dipped immediately in mud; the plants were packed in a box and the inter-spaces in the root systems were filled with soil.

3. Twenty-four plants packed in the same manner as in (2), but the inter-spaces were filled with saw dust. Water was sprinkled over all the plants and they were kept in sunshine and planted on the 6th day.

During this time, all the packages were given a thorough shaking, as they would ordinarily receive in railway transit and were also dropped in the ground a couple of times from a height of 3 ft. or so.

Observations taken a couple of months after their planting are as under :—

Date of planting.	Method of packing.	Number of plants died.	Weight of packed plants.
7th Sept., 1932	No. 1	2	Mds. Srs.
	No. 2	Nil	3 7
	No. 3	13	1 14 0 30
17th September, 1932	No. 1	1	3 21
	No. 2	2	1 35
	No. 3	22	1 0
27th February, 1933	No. 1	Nil	1 35
	No. 2	2	1 6
	No. 3	6	0 18

2. Out of 72 plants (in three trials) under each method of packing only three plants died in the first mode of packing, four in the second and 41 in the third, showing that first and second methods

are equally efficient while method No. 3 has proved a failure.

3. In regard to the weight of the packages, method No. 2 resulted in the reduction of weight and consequently freight charges by almost one-half. This advantage is more evident in the case of bigger plants which have to be dug from the nursery with big earth balls (gachi) to avoid excessive cutting of the root system. Big earth balls are also more likely to break in transit.

4. There is also a saving in the cost of packing, inasmuch as no gunny bags and twine have to be used in tying the balls of earth. In actual practice the cost of packing by 2nd method has come to only about a third of that by method No. 1. Further the packing of plants by method No. 2 has also been found to be much less laborious.

Simultaneously with the above experiment it was decided to ascertain the best way to treat the top parts of these plants before despatching them from the nursery. For this purpose the plants were divided into 4 lots, of which three were treated as follows and one left untreated :—

- (1) Plants headed back severely, i.e., only 3 or 4 main limbs of about 5 to 6 inches length on the main stem left and rest pruned off.
- (2) Plants completely defoliated but not pruned.
- (3) Plants headed back slightly by trimming off the shoots.

Detailed observations taken on these different lots of plants revealed that there was no appreciable difference in the death rate of the plants under the

various treatments. Regarding the growth of the plants subsequent to planting, however, it was observed that plants slightly headed back (lot 3) produced better growth than the rest.

It would, therefore, be desirable to reduce freight charges as well as cost of packing by adopting the system described under method No. 2, taking care at the same time to practise a slight heading back of the shoots before despatching them from the nurseries.

It would be advisable to water the plants immediately after they are planted in the field. The roots of the trees should be as little exposed as possible to the rays of the sun. The planting should preferably be done in the evening when sunshine is not very strong.

Storage of Malta Oranges at Room Temperature :—Like most other fruits Malta oranges fetch very low price in season, in certain localities; as low as a rupee or two per hundred in February. After March there is a great scarcity of the fruit in local markets and in April they cannot be had even at four times the price prevalent in the season.

Owing to the lack of cold storage facilities in the province, the growers and dealers find it difficult to store their oranges later than early March, after which the rate of the decay in fruits rapidly rises. In order to see how far these fruits could be kept at ordinary room temperature without refrigeration facilities, a trial was carried out in 1933.

Three hundred fruits of common Malta were carefully picked from 2 trees on 4th February, 1933, taking care not to bruise the fruits, and were properly

cleaned and sorted. Only the sound and healthy fruits were selected and were subjected to the following treatments:—

(1) Fifty fruits were kept as such, i.e., control for comparison. (2) Fifty fruits were wrapped in butter paper. (3) Fifty fruits were dipped in melted paraffin and were then wrapped in butter paper. (4) Fifty fruits were dipped as in (3) and then wrapped in ordinary tissue paper. (5) Fifty fruits were washed in 5 per cent sodium bicarbonate solution at 110° —115°F for 8 minutes. After drying they were dipped in melted paraffin and wrapped in butter paper. (6) Fifty fruits were treated as in (5) and then wrapped in ordinary wrapping tissue paper. All the above lots were packed in standard packing cases and kept at room temperatures.

Detailed observations were taken on different occasions and these are recorded in the following tables:—

All the fruit was picked on 4th Feb., 1933.

PERCENTAGE OF SOUND FRUITS ON VARIOUS DATES

Date of observation.	Lot No. 1	Lot No. 2	Lot No. 3	Lot No. 4	Lot No. 5	Lot No. 6
12-3-1933	70.0	83.7	94.0	96.0	84.0	96.0
28-3-1933	36.0	79.6	90.0	90.0	60.0	68.0
8-4-1933	34.0	77.6	90.0	88.8	58.0	68.0
25-4-1933	4.0	47.0	88.0	84.0	46.0	56.0
10-5-1933	Nil	6.2	74.0	66.0	28.0	46.0
22-5-1933	Nil	Nil	42.0	24.0	10.0	10.0
30-5-1933	Nil	Nil	10.0	6.0	Nil	Nil

From the above it appears that (a) fruits of lots No. 3 and 4 remained in good condition in storage for longer time than the rest, (b) wrapping of fruits has given better results than control.

(c) butter paper appears to be slightly better than ordinary tissue paper.

The above trials show that it is possible to a certain extent to prolong the storage of Malta fruits by dipping the fruits in melted paraffin and wrapping them with butter paper.

Careful handling of fruits.—In general the fruit growers in the Punjab do not seem to pay any great attention to careful handling of fruits during harvesting and packing and do not hesitate to throw the fruit in the baskets from a considerable height or distance. In order to see exactly the difference in keeping quality between the roughly handled and properly handled fruits, an experiment on a small scale was carried out simultaneously along with the above-mentioned trials. Fifty malta fruits were carefully picked on 13th February, 1933, of which 25 were dropped on the ground from a height of 5 feet and the remaining 25 were kept as control. Both lots were packed in packing cases. The observations taken on their storage quality at different dates is given in the following statement :

PERCENTAGE OF SOUND FRUITS IN THE TWO LOTS KEPT IN STORAGE ON 13TH FEBRUARY 1933.

Date of observation.	Lot No. 1 Badly handled fruits.	Lot No. 2 Properly handled fruits.
	Percentage of good fruits.	
13th February, 1933	100%	100%
12th March, 1933	60	80
28th March, 1933	60	80
8th April, 1933	Nil	80
25th April, 1933	48	72
10th May, 1933	8	12
2nd May, 1933	Nil	Nil
30th May, 1933	Nil	Nil

The above table indicates that fruits properly handled, keep longer in storage than roughly handled fruits.

Citrus Rootstock Investigations and Grape Vine Hybridization

by

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Although nearly all kinds of fruits are grown in the Punjab, the area under citrus fruits far exceeds the area under any single kind. Besides, the land recently opened up for cultivation, in canal colonies, offers a potential field for the extension of fruit culture especially citriculture and, in fact, our province may ultimately specialise in citrus cultivation.

The citrus fruits grown include *malta*, *sangtra*, *mitha*, *kaghzi nimboo*, *chakodra*, *galgal*, etc. A new citrus fruit called grape fruit, introduced recently by the Department of Agriculture, is also becoming quite popular. Some of these fruits especially the *malta*, *sangtra*, and grape fruit are produced almost invariably by budding on to rootstocks like *jattikhatti* (Rough lemon), *mokari* (Citron), *mitha* (sweet-lime), *Jullunduri khatti* (Smooth lemon) and *Kharna Khatta*, etc., etc. The nurserymen and growers have vague and varied impressions about the suitability or otherwise of these rootstocks. The choice of a rootstock for a particular kind of fruit and under particular conditions may differ with different individuals. Again the plants meant for widely different

localities may be budded on one and the same rootstock without realising that the rootstock employed will not do equally well under varied conditions. In view of this it is not surprising to find that different rootstocks are being indiscriminately used for different scions, i.e., *malta*, *sangtra*, etc.

As compared with this state of affairs it may interest the readers to know that, as a result of experiments carried out in other countries, every fruit grower knows the kind of rootstock he is to use not only for different kinds of fruits but also for different varieties of the same fruit and for different types of soil. It is demonstrated to the growers that the rootstocks determine the amount and quality of fruit, the length of life and the resistance against diseases of the scion varieties budded or grafted on them. Such information must be obtained for the benefit of our growers by experiments which are now in progress at the Horticultural Research Sub-Station, Montgomery financed by the Imperial Council of Agricultural Research, India.

In view of the short duration of three years over which these experiments have

been carried out, results of practical significance can not yet be given out. All the same it is considered advisable to acquaint the readers with the nature and scope of experimental work in progress, which is briefly mentioned as under:—

(1) The influence of different rootstocks on the vigour, cropping, disease resistance, fruit quality and longevity of such scion varieties as *malta*, *sangtra* and *grape-fruit*.—This forms the main line of work so far as rootstock investigations are concerned. The experiments on the suitability of stocks, for various kinds of soil and fruits, are of fundamental importance to the development of fruit industry on sound lines. But they are evidently "long term" experiments, since the observations have to be continued over the life time of the fruit tree to warrant the adoption of results in orchard practice. Furthermore, the understanding of rootstock effects is essential preliminary to the production of uniform material regarding which, of late, much emphasis is being laid as being a pre-requisite to the carrying out of all types of field experiments in horticulture.

The rootstocks employed are those that are commonly used by nurserymen and were grown both from seed and by the rooting of stem cuttings before they were budded over with various scion varieties chiefly grown in the province. The names of the rootstock varieties are (1) *Kharna Khatta*, (2) *Jatti Khatti* (rough lemon), (3) *mitha* (sweet lime), (4) *mokari* (citron), (5) *chakodra* (pomelo), (6) *Jullunduri Khatti* (smooth lemon), and (7) *nasnaran* (a rootstock variety from Ceylon).

The experimental material was planted at Montgomery in February, 1937 and covers an area of about fifteen acres. The plants are now about three years of age and the effects of rootstocks on the scions are striking even at this stage. The observations so far made relate to the vigour of plants as influenced by different rootstocks not only from year to year but also in different periods of the same year. This naturally involved the measuring of vigour of individual plants after every fortnight which may have to be continued for several years more.

The results so far achieved or indicated are interesting in several ways, but it is not considered advisable to discuss them in detail at this stage as it cannot be said how far the rootstocks in question will maintain this behaviour in later years or how they may influence cropping. There seems to be, however, no doubt that rootstock No. 43 (*kharna khatta*) has proved to be most invigorating for *malta*, *sangtra* and *grape fruit* and rootstock No. 50 (*mitha* or sweet lime) is the most dwarfing one. However, there are strong indications that rootstock No. 20 (*jatti khatti* or rough lemon) may prove, in course of time, either as invigorating as *kharna khatta* or next best to it. There are many other interesting observations regarding other stocks but it would be too early to give them out at this stage.

(2) A Study on the nomenclature of various forms of citrus rootstocks available in India.—There is, perhaps, more confusion in the nomenclature of citrus varieties than in the case of other fruits. A particular variety may be known under several distinct names in various provinces or even in different

parts of the same province which indeed is bad enough but the fact that distinctly different varieties may be called by one and the same name in various localities is indeed most ruinous. The extent of confusion prevailing and the amount of harm that can accrue from this state of affairs may be judged from the fact that a leading fruit grower in the Punjab carried out a preliminary rootstock experiment, on a small scale, and concluded that "mokari" as a rootstock for *malta* proved better than others. On the contrary, 'mokari' (citron) is known by experience to produce short-lived plants though this concept is not yet supported by experimental evidence. A careful enquiry into the matter, however, revealed that the rootstock variety, proving the best and erroneously labelled as *Mokari*, was in reality *Kharna Khatta*.

It is evident that if the results of experimental trials conducted by him, evidently based on wrong nomenclature, had been printed as such, they could have done untold harm to the citrus industry. The mistake was nipped in the bud by simultaneously disclosing the right name of the rootstock variety by proper identification. Such instances can be easily multiplied and unless something effective is done, by way of identification and classification of various forms to standardize nomenclature throughout the province and preferably in the country, no real headway is possible to the proper understanding of the rootstocks and much less to their influence on various scions.

With a view, therefore, to make a sifting enquiry into the magnitude of important forms of citrus species exist-

ing in India, an effort was made to collect as many of them as possible (numbering about fifty) from various parts of India and Ceylon. New forms are being added to this collection. A study of such morphological characters as root morphology, habit of growth, leaf characters, floral morphology and fruit characters made with the help of photography, actual measurements and counts etc. of these varieties will soon be completed with a view to standardize the nomenclature. It is possible that some of these new forms may turn out to be better rootstocks than those now used in commerce.

(3) **A Study of the Size of unworked rootstocks as affected by the method of propagation.**—It is held that, as compared with the plants produced from cuttings, the seedlings (i.e. plants produced from seed) as a rule, grow to larger sized trees, live longer and bear heavier crops although they start fruiting at a comparatively advanced age. This is usually explained by the fact that seedlings possess the tap root, which, in case of the plants raised from cuttings, is invariably lacking. The material under study was not planted to serve as a basis for this investigation but it incidentally served to elicit information on this issue.

In the rootstock collection area, six plants, each of about fifty varieties, were planted, of which three were raised from seed and three from cuttings. This was done partly to study the performance of unworked root-stocks, side by side with similar material worked to various scion varieties and partly to serve as a basis for the standardization of nomenclature of these forms.

However, there were marked differences in the size of plants and their precocity within each variety evidently caused by the differences in methods of propagation. Data were collected, therefore, on this aspect of the problem and, since most of the varieties turned out to be one and the same, the number of comparable plants under both the sets thus increased considerably. The results reveal the possibility of growing large-sized trees comparatively much earlier by the rooting of stem cuttings than by seed. It may also be added that the trees grown from cuttings are more precocious and prolific than their contemporaries raised from seed. The behaviour of these trees will be under observation for some years more before the results are finally published. It would be interesting to see how the differences in tree size and precocity, brought about in the rootstocks by the difference in methods of propagation, would ultimately express themselves in the scion varieties budded on them.

(4) **Other experiments.**—There are a number of other field experiments, as given below, which are in progress at Montgomery, and which have a bearing on the rootstock problem. But these have not yet yielded information to an extent that would be safe to discuss here.

- (a) The study of root system of different rootstocks propagated from seed and from cuttings.
- (b) The behaviour of different rootstocks as affected by transplanting.
- (c) The relative ability of rootstocks to produce material of uniform vigour.

(d) Is the variability in vigour of plants an inherent character? If not how is it influenced by environmental factors?

(e) Factors affecting the germination of citrus seeds, such as :

- (1) season of sowing,
- (2) condition of seed,
- (3) storage of seed,
- (4) varietal.

II. Grape Vine Hybridization

The grape is not cultivated on a commercial scale in any part of the province, but it appears to have taken fancy with the growers inasmuch as a few plants may be seen in any locality. It may be due partly to unsuitable climate and partly to the lack of varieties suitable for our conditions. It was particularly with the latter viewpoint that important varieties, numbering about 120, from all over the world, were imported for acclimatization with the result that a few of them, such as Black Prince and Seedless, etc., proved quite promising. There are still others that are outstanding with regard to one or the other most desirable feature. For instance **Madresfield Court** and **Muscat of Alexandria** are noted for taste and aroma, **Dakh** and **Bhokari** are very prolific, **Pandhari Sahabi** excels every other for its attractive bunches and berries, **Damas Rose** is noted for the size of its berries and **Madeleine Angevine**, **Khalili** and **Kishmish White** are very early ripeners and escape the monsoon rains. The desirable features of these and such other varieties may be combined by making crosses between suitable parents. This type of work, aiming at the origination of new varieties, through hybridization, has now been

started with the financial assistance of the Imperial Council of Agricultural Research, India.

The collection of about 130 grape vine varieties, made from vine growing parts of the world, forms the nucleus for the hybridization work at Lyallpur. The seedlings are raised and planted at the Horticultural Research Sub-station, Montgomery for selection and multiplication, in due course, of the promising seedlings.

The varietal characters of the parent varieties, used in crossing, were recorded before taking up the work of hybridization in 1937, which was continued in 1938 and 1939. The seed of crosses, made in 1937, yielded about 500 seedlings, which were subsequently planted

in the field for further observations. Similarly, the seedlings resulting from the seed representing crosses, made in 1938 and 1939, will be planted, in due course, for study.

The scope of the work would be :—

- (a) To test the value of different parents for giving the best progeny plants from economic standpoint.
- (b) To evolve better seedless varieties, that are generally liked by the people as table grapes, and
- (c) To evolve early ripening varieties giving better performance both regarding quality and quantity of fruit over the existing ones in the collection.

GRAPES

by

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Grape-vine.—Grapes of inferior quality have been grown in the Punjab here and there in some gardens for a considerable time. Apart from the inferior quality, the main difficulty in the successful cultivation of grapes has been the early rains which spoil the fruit. With a view to find out suitable varieties of table grapes for the Punjab, both from the point of yield and of quality of the fruit and which would ripen earlier than the commencement of rains, a very comprehensive trial, including 104 varieties (which number, after proper classification was reduced to 76) belonging to various species of grapes, obtained from important centres in India such as Quetta, Peshawar, Poona, etc., and from foreign countries like California (U. S. A.), Australia, has been underway since 1928. Later some more varieties have been

added to the collection obtained from India and foreign centres like Mesopotamia, Texas, Florida, etc. so that the collection of varieties at present stands at 116. About a dozen varieties obtained from Russia, could not survive. The names of the varieties existing in the collection area are given in the appendix. Some varieties, viz., No. 77 to No. 116 have been under observation for only a couple of years and nothing can be said as to the quality of fruit or their yielding capacity, but varieties obtained in 1928, have by now borne fruits for 6-7 years and on the basis of the detailed records, we are in a position to say definitely which of them can be successfully grown in the Punjab. Tables No: 1 & 2 give in brief the yield and income of the vineyard and the average yields of the promising varieties.

Statement No. 1 giving yield and income record of the vine-yard in the Experimental Garden at Lyalpur.

(AN ACRE ACCOMMODATES 435 VINES)

Number of bearing vines in this vine-yard (excluding those varieties which have so far borne no fruit or less than 2 srs. of fruit per vine)=279.

	1933			1934			1935			1936			1937		
	Mds.	Srs.	Chks.	Mds.	Srs.	Chks.	Mds.	Srs.	Chks.	Mds.	Srs.	Chks.	Mds.	Srs.	Chks.
Total Yield of 279 vines ...	54	10	0	24	14	6½	47	33	1	59	6	5½	35	22	2
Total income from 279 vines ...	Rs. 538-5-5			Rs. 257-13-10			Rs. 535-1-0			Rs. 531-10-6			Rs. 459-3-8		
Average yield per vine of all varieties by different systems of pruning ...	0	7	12½	0	3	8 app.	0	6	14	0	8	7½	0	5	1½
Average yield per acre ...	84	25	0	37	39	0	74	23	0	93	32	0	55	17	0
Average yield of 8 promising varieties by cane system of pruning (62 vines) ...	0	11	5 app.	0	5	4 app.	0	10	1 app.	0	11	4½ app.	0	6	7 app.
Average yield per acre ...	122	34	6	57	3	5	109	14	2	122	26	13	69	35	11½
Highest yield obtained from a vine ...	1	28	7 (Dakh)	0	26	0 (Dakh)	1	7	1 (Dakh)	0	38	4 (Fakadi)	0	34	0 (Palomino)

NOTE :—The figures for the year 1938 and 1939 are not included in above statement as in these years a large number of vines of inferior varieties were uprooted and hence the total number of vines was different in these years. The average yield of promising varieties for these years is, however, included in statement No. 2.

Statement No. 2 showing the average yield of eight promising varieties of grapes by cane system of pruning for the last seven years (1933-39).

Serial No.	Name of Variety.	No. of Plants.	Average Yield per plant.							Average yield per plant from 1933-1939.	Remarks.
			1933	1934	1935	1936	1937	1938	1939		
1	Seedless	7	lbs. ozs. 9-8	lbs. ozs. 5-4	lbs. ozs. 10-0	lbs. ozs. 6-6	lbs. ozs. 1-0	lbs. ozs. 6-2	lbs. ozs. 4-6	lbs. ozs. 6-1	
2	Poster's Seedling	9	8-2	5-10	7-6	15-8	5-2	5-8	7-10	7-13	
3	Kandhari	4	22-2	2-6	21-10	35-5	9-10	11-8	3-0	15-1	
4	Fandhari Sahebi	4	30-0	15-14	13-14	24-0	0-4*	8-14	11-4	14-14	*In 1937 low yield is due to severe attack of anthracnose on this variety.
5	Waltham cross	2	14-12	8-0	14-4	7-2	6-12	13-6	16-0	11-7	
6	Black Hamburgh	3	15-12	7-2	10-10	23-2	12-6	8-2	13-2	13-10	
7	Dakh	16	40-8	16-6	33-2	30-12	14-0	21-0	20-6	25-3	
8	Black Prince	17	19-4	11-4	22-4	22-12	23-4	25-12	9-2	19-6	

It may, however, be mentioned that in order to see the yielding capacity of only promising varieties of grapes on a large area, a plot of about half an acre has been planted with such varieties. Two dozen plants of each variety are represented there. These vines are expected to bear in the next year.

A brief description of the promising varieties is not given here, as the same has already appeared in the October 1938 issue of the Punjab Fruit Journal.

Physio-Chemical Analysis of Grapes.—

In order to determine the quality of different varieties of grapes, Physio-chemical analysis of promising varieties were carried out and the results are tabulated in Table No: 3. The percentage weight of berries and stems are tabulated on the weight of bunch, the percentage of juice and pomace on the weight of stemmed berries and total soluble solids and acidity were determined from the juice. Total soluble solids and acidity, which are considered to be good indices of quality, show that Foster's seedling, Black prince, Kandhari and Seedless are better than Pandhari Sahebi, Dakh, Waltham Cross and Black Hamburgh.

Training and Pruning of Grape Vines.—

It is a recognised fact that yield of the grape vines is dependent to a very great extent on the method of pruning and training practised, and that different varieties of the vines require different systems of pruning depending upon their vigour and bearing habit.

Hence with a view to find out the best system of pruning and training the grape vines under our climate, six plants

of each variety under trial at Lyallpur were planted in separate rows. In each row two plants were pruned according to each system of pruning, viz., Head, Cane & Cordon as shown in the sketches. The brief description of the systems is given below but the reader is referred to the opposite page for sketches in order to understand the terms used.

1. Head System.—The vines are trained to form one straight stem for the first two years to a height of 3—4 feet by pruning or cutting back the stem, allowing only one stem to grow and removing all others, and keeping the stem straight by some stake or wooden support. At the head, short branches four to six in number, are allowed to develop. On these branches (arms) at the time of pruning, are left, spurs or nodes, which consist of the basal portions of one year old shoots (Canes). The total number of these short spurs on all the arms, varies from 8—12 according to the vigour of the vine, and their length depends upon the vigour of the canes from which they are made. This system of pruning gives good results only with varieties which are not vigorous growers, i.e., do not develop long canes or the fertility of soil, irrigation facilities or climatic conditions do not favour luxuriant growth of vine. This is also suitable for those varieties which develop fruit on the lowest 2 or 3 buds of the cane, such as wine grapes or some table grapes.

2. Cane system.—In varieties where the basal 2 or 3 buds do not produce any crop or varieties which make vigorous growth, it is necessary to leave 4—6 fruit canes (spurs) each 2—4 feet long. Unlike the Head System, the renewal

spurs (normally of one or two buds only) are left with the arms to produce canes for the following year so that the fruit canes are cut off and replaced every year by new fruit canes, developed from renewal spurs. To support the long canes and to keep the fruit off the ground, trellising (i.e., supporting canes on wire) is required. This method is suitable for raisin grapes and some table grapes.

3. Cordon System.—In this system the main trunk is 8—10 feet long and, instead of being upright, is trained horizontally, on one side only, along the lower wire of the trellis. This extension of the trunk has the effect of making the buds on the lower part of the canes fruitful, and facilitates distribution of the crop over a greater length. The number and length of fruit spurs left on the stem is about the same as in case of Head Pruning. This system is suited to vigorous varieties of table grapes which produce large berries and large branches and are grown in a rich soil with an abundant water supply.

Observations taken over a period of two years show that varieties like Madaline Angevine, Agawam (shy bearers 2—4 seers each, also not vigorous grower) have given equally good results both by the Head System and Cane System and poor result by Cordon System. In the case of Chaouch, Kandhari, Hussaini black, Pandhari Sahebi & Black Prince which are fairly vigorous growers and also good croppers (10—15 seers each) Cane system has proved much better than Head System and some what better than Cordon System. In the case of a most vigorous variety namely Bhokari

the Cordon has proved slightly better than cane system. On the whole, cane system has given the highest yields for most varieties and is recommended for general adoption.

Manurial Experiment on Grape Vine.—This experiment was laid out in the Indian Mildura Fruit Farm, Renala Khurd, District Montgomery, in the year 1928. Two-hundred and seventy vines of Muscat variety of apparently uniform vigour were selected. Later treatments such as cultivation, Irrigation, pruning etc., were also kept as uniform as possible. Out of the 270 vines, 30 vines were kept under each treatment, viz (i) sodium nitrate, (3 lbs. in 2 doses, in March and April), (ii) farmyard manure (50 lbs. in March), (iii) ammonium sulphate ($2\frac{1}{2}$ lbs. in two doses in March and April), (iv) dried blood (4 lbs. in two doses in March and April), (v) superphosphate (4 lbs. in two doses in March and April), (vi) green manuring with "Guara" (sown in May and buried in August), (vii) complete fertilizer (6 lbs. in two doses in April and May), (viii) toria cake (8 lbs. in two doses in March, April) and (ix) 30 vines were kept as control. To avoid the contiguous effect of the treatment of adjacent rows, one row was left untreated between every set of vines that were under different treatments. The results so far obtained from this experiment are :—

- (1) that all the manured vines, excepting those green manured, gave higher yields than the unmanured vines;
- (2) that ammonium sulphate stood

first continuously for the first three years, and occupied a second position in the fourth year, giving a slightly less yield than farmyard manure.

(3) In the first year sodium nitrate stood first; in the second year second; in the third year 5th, and in the fourth year it fell down to the 8th position. Salt incrustations appeared in the 2nd year showing that a continued use of sodium nitrate is inadvisable in soils which are inclined to be alkaline.

(4) Farmyard manure which stood 4th in the 1st year, 3rd in the 2nd year, and second in the 3rd, occupied in the 4th year the first position, showing the beneficial effect of the continued use of farmyard manure.

(5) Toria cake proved less beneficial than farmyard manure in the first two years, but came to its level in the 3rd year, and was only slightly lower in the fourth year, showing that its residual effect is more or less similar to that of farmyard manure.

(6) Dried blood gave results nearly similar to toria cake.

(7) Superphosphate and complete fertilizers proved least beneficial of all.

The effect of ringing on Grape vines.—With the object of finding out, how far the maturity of grapes could be hastened, this experiment was conducted on Black Prince and Dakh varieties for 3 years. The vines under this experiments were ringed by Swarbrick method viz. a complete ring of bark 1½ inch wide was removed 3-4" above the base of the cane. Suitable vines were kept for comparison as control, i.e., no ringing done on them. On the ringed vines, the

operation of ringing was performed at three different stages, i.e., (a) at full blossom; (b) when berries had completely set and (c) two weeks after the setting of berries. The total number of canes as well as the total number of bunches, borne on each vine, were counted. At the harvest time, ripe bunches were removed from all the vines on the same date, at an interval of 5 days, and the number of ripe bunches and their weights were accurately recorded. Also 600 berries from each treatment were taken and weighed, in order to see if ringing had produced any effect on the size of the berries. From the data collected, it has been possible to draw the following conclusions:—

1. That the wounds caused by ringing healed properly even without covering.

2. Ringing done at all the three stages, hastened maturity as compared with the control.

3. Ringing done 2 weeks after the setting of berries, hastened maturity the most.

4. Ringing did not show any significant effect on the size of the berries in the varieties under trial.

Grape vine pollination studies.—Prior to the work on grape hybridization mentioned elsewhere pollination studies on grapes were carried out for about three years which, for the benefit of those interested in grape hybridization are briefly summarized below:—

1. **Time of opening of flowers :—**

- (a) It takes 3—5 days for all the flowers in an inflorescence to open

in the case of different varieties under study.

- (b) The flowers do not open at night, but open from 8 A.M. to 2 P.M. the maximum number of flowers, opening between 10 A.M. to 12 noon.
- (c) Majority of the flowers in an inflorescence open on the 2nd and 3rd day after the date of commencement of opening.

2. Time of opening of anthers and condition of stigma at that time.—At the time of opening of flowers the anthers were examined by a hand lens in case of all the varieties under study. The anthers dehisce as soon as the flowers open and the pollen grains emerge out even if a slight jerk is given to the filaments. The stigmas at this time has plenty of shining substance of a mucilaginous nature and hence are receptive i.e., ready to receive pollen.

3. Germination of pollen grains :—Different concentrations of sucrose and glucose solutions were tried for the germination of pollen grains. Some workers claim sucrose solution of 15 to 20 per cent concentration to be quite efficacious for this purpose, but the results obtained by us reveal that glucose solution is decidedly better than sucrose.

4. The addition of Bacto Agar to the solutions of both glucose and sucrose stimulants the growth of pollen tubes, which would otherwise remain inhibited. But the results were better in case of glucose than in the case of sucrose.

5. Time required for proper germination of the pollen grains.—Observations

on the germination of pollen grains were made every two hours to find out the maximum period required for proper germination. The observation recorded indicates that maximum germination can be obtained six hours after the mounting of pollen in the solution (7.5 per cent. glucose plus 0.1% agar).

6. Parthenocarp in grape vines.—In order to find out if the seedless types of grape vines require any pollination, or develop parthenocarpically, a preliminary trial was carried out in 1934. One inflorescence of a vine No. 1913 was emasculated and bagged. After the setting had taken place, the berries were counted—69 berries set, out of 82 emasculated flowers, which gave a bunch, comparing favourably with a normally set bunch. This preliminary trial indicates that the fruit develops parthenocarpically in the seedless type under study.

Studies on the Distinguishing characters of grape vine varieties grown at Lyallpur.—A large number of varieties, introduced from abroad and various parts of India, on reaching their fruiting age were found to be misnamed as could be judged from their growth character, leaves, bunches, etc. The vines had, therefore, to be designated by serial numbers rather than names for a certain number of years. During this period the following data has been collected :—

(1) An accurate and complete study of the character and properties of all the parts of sixty-six grape vine varieties under trial has been made. It consists of the study of (a) vigour, (b) unfolding leaves, (c) growing shoots, (d) full grown leaves, (e) one year old wood and (f) bunches and berries.

(2) Some of the descriptive data so gathered has been tabulated and discussed from which it is evident that certain features of the vine do not serve as good a guide for diagnostic purposes as others.

(3) In constructing the identification chart, only such characters are employed as would be easy of adoption and afford, more or less, a constant specific value under diverse conditions. These features used in their order of importance are (a) leaf shape and pubescence, (b) colour of berries, (c) shape of berries, (d) colour of growing shoots and their pubescence, (e) cane characters and (f) some characters of peduncle, pedicel and skin.

(4) It is evident that all the features enumerated above when used conjointly, have helped to isolate all the varieties under trial.

A detailed article on the subject of distinguishing characters of grape vine varieties (authors: S.S. Lal Singh and Dr. Sham Singh) has been sent to the Im-

perial Council of Agricultural Research for publication as a special bulletin or as a research paper in the Indian Journal of Agricultural Science. This subject need not, therefore, be discussed in this journal.

NURSERY PLANTS

of

MALTA, SANGTRA AND
GRAPE FRUIT,

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of

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MANGOES

by

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Climatic requirements for this fruit and the scope for its cultivation have already been discussed, in this issue, under climatology of the Punjab fruits.

Varietal Trials.—Quite a large number of varieties of mangoes (names given in the appendix) are being tried at Lyallpur, Gurdaspur and Attari (District Amritsar). The plants of most of these varieties are yet too young to bear any crop and consequently their suitability or otherwise cannot be judged at present. Out of the varieties which have borne fruit, Langra at Lyallpur and Aman Dusehri, Alphonso, Samar Bahishti, Zafrani, Bombay Green and Asojia Surkha at Gurdaspur have proved promising with regard to their quality of fruit and yielding capacity.

Some varieties of excellent quality of fruit have been exhibited from time to

time at Multan and Muzaffargarh fruit shows and out of these Mohammadwala, Sufaida local, Mundhi, Kharbuza, Fida, Khira, Khasi and Khangarhi Bacha of Muzaffargarh and Rahim Pasand, Shahansha, Dilruba and Tori of Multan District can be safely recommended to the growers.

Propagating mango trees of outstanding merit.—In some localities of the Punjab and more particularly in the districts of Multan and Muzaffargarh, one comes across a number of mango trees of outstanding merit both in regard to yield and quality of fruit and some of them have been known to fetch an income of Rs. 50/- to Rs. 500/- each per year. Until a few years back, the proprietors of these trees unfortunately, were not prepared to take the grafts from these trees either for extending their own gardens or for sale to the public. Some of them were even so superstitious as to

think that removal of grafts from the trees would render them un-productive in future and some did not wish to give grafts out of monopolistic attitude. As a result of several short courses on fruit cultivation in that district, coupled with demonstrations and a good deal of propaganda at District Fruit Shows, etc., the conditions are slightly better now in as much as many of the proprietors are now prepared to allow the grafts to be taken. A few hundred grafts from these trees are taken every year for supply to the public and planting a few of each at the Government farm for further propagation. Of course the proprietors are suitably compensated for these grafts either by cash payment or supply of a share of the grafts taken. But a good deal of propaganda is yet required to overcome this long established prejudice so that these trees of excellent merit are not allowed to go out of existence without propagating their progeny. It must be emphasised that removal of grafts from these trees, in reasonable number, does not render them unproductive. Instead of owning one or two such trees, the proprietors would do well to have a regular plantation of these for which the services of the Government Fruit Specialist can be solicited. What is needed is to make a big drive to produce thousands of grafts from these trees of outstanding merit and establish big mango plantations in these districts.

Budding Experiments.—In the Punjab, so far, grafting (enarching) happens to be the only commercial method which ensures that the plants thus propagated would be true to type. It will be seen that this method at its best is not only

expensive but very cumbersome and tedious. If a cheaper and more expeditious method of propagating mangoes, viz, budding, could prove a success, as is the case in some foreign countries and to some extent in some places in India, it would revolutionise the mango industry in the Punjab. It may be mentioned that in India, budding of mangoes has not yet been taken up by nurserymen on commercial scale anywhere. If budding succeeds, not only choicest mango varieties would be raised by budding in the nursery, by bringing budwood from selected trees, even though situated at a distance, but it would make the top-working of old, worthless trees a cheap proposition. This latter mentioned aspect alone offers immense possibilities as throughout the Punjab, there are millions of mango trees yielding fruit of inferior quality. At present the greatest obstacle in the way of extending the nursery production of grafted mangoes is the limited number of branches that can be conveniently utilized for this purpose from a parent tree which should also be near the nursery so that the potted seedlings can be placed under it for the purpose of enarching.

So, with a view to find out if budding of mangoes has any possibility in the Punjab, preliminary trials in this connection are being conducted at Lyallpur, Gurdaspur, Pathankot and Hoshiarpur and the results obtained so far show:—

(1) The mango tree generally puts forth new shoots, called flushes, about 5 times during a year, viz., April, May, June, July and August. These flushes correspond to the period of greatest activity in the flow of cell sap. Budding operation is only possible during these flush periods.

(2) The age and thickness of shoots from which buds are taken should correspond with the age and thickness of stock used.

(3) The ideal period for budding operations varies slightly from place to place, depending upon the climatic conditions prevailing in the locality. Month of May proved more suitable at Lyallpur, while June and July proved better than others at Gurdaspur.

(4) Other conditions being equal, budding is more successful in the case of two years old seedlings than in the case of one year old stock. But it is more difficult to remove the budded plants from the nursery in the former than in the latter case because of the bigger tap root. However, advantage of this can be taken by planting the mango seedlings in the garden in their permanent places, and when of the right age and size can be budded in 'situ' and the budded plants allowed to flourish. The practical application of this finding, if commercially successful, would revolutionize the mango industry because the greatest impediment, in the extension of mango area, at present, is the high cost of mango plants on one hand and their usually high death rate after planting on the other.

Top-working mango trees.—As mentioned before, there are throughout the Province a very large number of seedling mango trees which bear fruit of very low quality and thus fetch very little income. As an experimental measure, a number of such trees at Lyallpur were top-worked in 1928. The usual method is to cut back the tree at a height of 4—5 feet (either the trunk of the tree or its main branches) to force it to give out new shoots and to graft over by enarch-

ing, the new shoots, with the potted mango graft i.e. the shoot or branch of the graft serves as scion and the new shoot from the old tree serves as stock. Top-working is particularly successful on those trees which are not more than 8—10 years old (in fact the younger the better) as in their case the trunks are not very thick and the wounds heal up very rapidly. Top-working in the case of big trees is no doubt laborious but it has got the advantage that a top-worked mango tree will come into bearing at a much earlier age than a newly planted grafted mango tree because the roots of the former are already well established. In top-worked trees, the grafted shoots were found to make 5—6 feet growth in 1½ years. The commercial fruit growers, who happen to have a considerable number of young mango seedling trees, would do well to have such worthless trees topworked to better varieties.

Top-working is done by enarching which, as stated before, is rather laborious and expensive. Budding is being tried and if this proves successful, top-working of trees, by this method, would become much easier.

Study of Fruit Bud Differentiation in Mango.—A preliminary study on the fruit bud differentiation in mango was taken up this year with a view to determine the time at which this phenomenon takes place. A knowledge of the time of differentiation is of fundamental importance as, it is believed, that cultural practices, prior to fruit bud differentiation period, predetermine the development of fruit buds and consequently have a direct bearing on the fruit crop of the following year.

The results so far show that fruit bud initiation takes place sometime before November and, consequently, it is intended to start this study early in the season next year to know the exact time when this phenomenon takes place.

Malformation of inflorescence in mangoes.—Malformation of inflorescence, as the name implies, is a disease of the inflorescence of the mango in as much as the flower panicles, instead of developing normal flowers, either dry up or develop into a mass of crumpled leafy growth. The cause or causes of this malady are not yet known but it is becoming very serious in many gardens. With a view to find out if the disease can be controlled or minimized by cultural means (i.e. pruning and manuring etc.) an experiment has been started at Jamalpur Fruit Farm near Pathankot but it is too early to give any results.

Biennial Bearing in Mangoes.—Biennial, irregular, periodic or bearing of mangoes in alternate year is a problem of great economic importance to mango growers as in 'on' year (when the trees are bearing fruit) due to abundance of crop the markets are glutted with fruit and in consequence price realized is very low and unremunerative, while in 'off' year (when there is very little fruit on the trees) the growers have little crop to offer for sale when the prices are high. In order to find out the relationship between various kinds of growths and productivity and to elucidate some of the growth conditions responsible for alternate bearing in mangoes, investigations were started at Lyallpur on about half a dozen full grown 'Langra' mango trees in 1932 and continued till 1938. Detailed results are being published in

the Indian Journal of Agricultural Science (December 1939) which show that (a) under Lyallpur conditions, as many 'flushes' as five, are produced during the growing season, commencing from April and ending with August. (b) The earlier 'flushes' i.e., those growing in April, May and June, produce more fruit in the following year than the 'flushes' produced later in the season i.e. July and August. Out of earlier flushes, April is more important than May, and May is more important than June, with respect to fruiting in the subsequent spring. (c) Individual shoots tend to bear in alternate years i.e. the shoots bearing fruit this year do not bear next year and those not bearing this year, generally bear in the following year. (d) During the year, the shoots bearing fruit, do not produce any growth, or if the growth is produced, it is very little. But the shoots not bearing fruit, make growth during the year. (e) Out of the shoots growing in the previous season, only such shoots are likely to bear fruit, in the following season, which stop growth earlier in the season i.e. by the end of August under Lyallpur conditions. (f) Growth and productivity are at the expense of one another in the same year i.e. if fruiting is heavy there would be very little growth and vice versa. (g) The number of shoots growing in one season greatly determines the number of shoots flowering in the next. Of course, it is an admitted fact that the number of new shoots on any tree is largely determined by the amount of care and nourishment given to the tree in the form of liberal irrigation, manuring and good cultivation. (h) While the shoots bearing fruit do not make growth during the year, and will not bear fruit next year,

the experiments have shown that if the flowering shoots are deblossomed or if the fruit is shed after setting, then they begin to grow and behave like ordinary shoots and bear fruit next year, provided the growth ceases early in the season. This indicates that if in a year of exceptionally heavy crop on a mango tree, a certain amount of thinning of flowers or fruit is practised it should induce the tree to bear normal crop next year.

From all these findings it is evident that if we can maintain a balance between growth and productivity of the tree, in the same year, i.e. if along with fruits enough number of shoots are induced to grow earlier and stop growth also earlier, it is possible to get regular crop every year. As a result of the above findings, it is hoped that it would be practicable to get regular crops from mango trees year after year. The experiments are still in progress.

RENEWAL OF MEMBERSHIP

"Ordinary" and "Regular" members of the Punjab Provincial Co-operative Fruit Development Board are requested that as their term for membership for 1939 has expired on 31st Dec., 1939 they should remit their renewal fees by Money Order. "Regular" members are required to remit Rupees six each while "Ordinary" members an amount of Rupees three only.

"Life" members who have not completed the instalments of their life membership are also requested to do so now.

DATES

by

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The importance of this fruit in the South Western Punjab, can be judged from the fact that there are about twenty lacs of female date palms in Muzaffargarh, Multan and Dera Ghazi Khan districts alone. Next to the mango it is the most paying crop in that tract. The revenue to the Government from the Date Palms (individual trees being taxed in those districts) is also considerable. But the quality of the fruit from these indigenous palms, with few exceptions here and there, is generally very poor, as compared with the Basra Dates successfully introduced by the Punjab Agricultural Department and established in the Date Farm at Muzaffargarh and other places in Muzaffargarh, Dera Ghazi Khan, Multan, Montgomery and Lyallpur Districts. The market price of the fruit of Basra Dates is 4—8 times higher than that of local dates while the yield is equally heavy.

There is a general impression in the minds of most people that districts of Multan, Muzaffargarh, Dera Ghazi Khan and Jhang are the only districts, best suited for growing dates. But this is an erroneous belief as proved by the trial of Basra Dates at Lyallpur. The records of yield and income for the last 15 years of about 40 date palms, planted in 1913

—1917 along the avenue at Lyallpur, are shown in the statement given below which are very much higher than those obtained at Muzaffargarh. Another observation of still greater importance is that, in places like Muzaffargarh, even a slight shower of rain causes decay in the fruit and a very large amount of fruit begins to drop. On the other hand, at Lyallpur, even heavy rain causes little decay of fruit on the tree and the damage is insignificant as compared with that at Muzaffargarh. There is no doubt that the canal colonies of Lyallpur and Montgomery, offer, at least as good a scope, if not actually better than even Multan, Muzaffargarh, etc., for date growing.

About 90 date suckers were planted on both sides of the central avenue of the experimental garden between 1930—32. Many of them began to bear fairly heavily at the age of 4-5 years and yield per palm in some cases came to about 20 seers. Photo of one such palm, heavily laden with fruit, appears elsewhere in this issue.

Season of Planting and Weight of Suckers to be Planted

The general practice among date growers in the Punjab has been to plant the suckers in September only and this

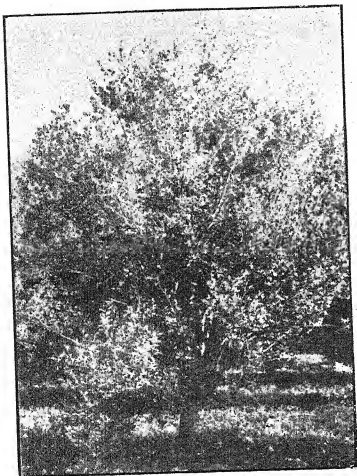
Statement No. 6 average yield of Arabian dates planted in the mango and date avenue of the Punjab Agricultural College, Lyallpur in 1913-1917

	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.
Total Yield ..	22-31	41-13	21-36	36-14	52-33	42-11	20-10	18-38	55-17	34-25½	43-20½	2-26½	64-25	31-20	34-29
Total Income in Rupees ..	227-13	403-4	219-0	363-11	528-4	431-13	222-10	142-2	360-0	232-12	301-15	26-11	570-0	262-8	303-7
No. of Palms ..	31	42	42	42	42	42	39	36	44	46	50	17	45	45	45
Average Yield per palm of all varieties in mds. and Srs. ..	0-29½	0-39½	0-21	0-34½	1-10½	1-0	0-20½	0-21	1-10½	0-30	0-34½	0-6½	1-17½	0-28	0-31
Average yield of Hillawi variety only.															
1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939				
Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.
27-8	44-11	30-33	15-34	11-15	40-24	20-25½	24-7½	1-28½	51-17½	21-38	27-19				
No. of Palms ..	28	28	28	27	25	27	30	29	13	32	31				
Average Yield per Palm ..	0-39	1-23	1-4	0-23½	0-18	1-20	0-27½	0-33½	0-5½	1-24½	0-23½				

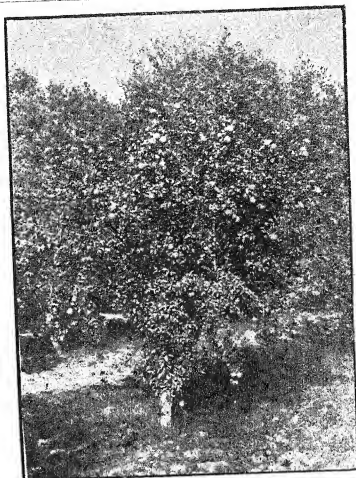
NOTE :- 1. 3 mds. and 29 srs. was the highest yield obtained from a palm of Hillawi variety and the price fetched amounted to Rs. 37-4.

2. Crop in the year 1936 was very poor due to improper artificial pollination. Moreover fruit of some trees was used for some experiment and hence it is not included in the above figures.

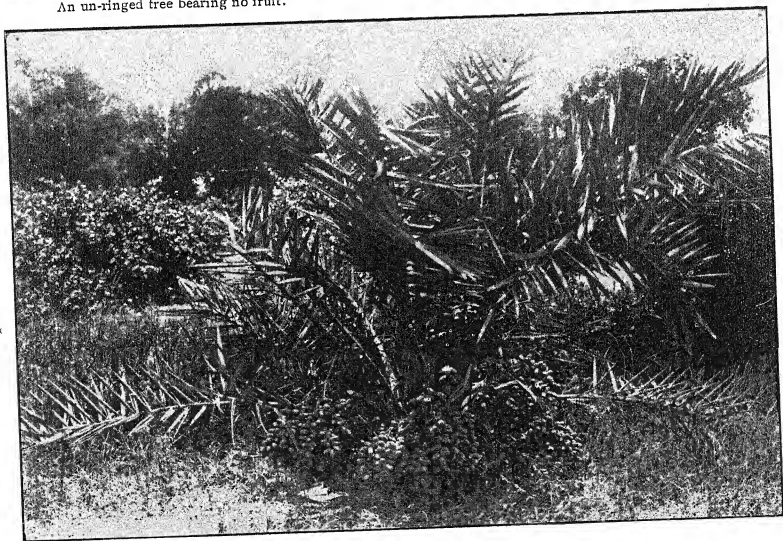
3. There has been slight variation in the number of date palms from year to year as fruit of some trees was used for experimental purpose.



An un-ringed tree bearing no fruit.



A ringed tree bearing fruit.



A 3½ year old "Hillawi" date palm bearing a heavy crop.

practice has been supported by various authorities. It has been held that suckers planted in spring fail to grow. It is also a firm belief of the date growers that for success in propagation, it is necessary to plant suckers of the biggest size, some people preferring to plant suckers weighing as much as a maund each:

In order to test the soundness of the prevailing practice and belief, in regard to the size of suckers and the best planting season, several trials involving about 4,000 suckers, of local varieties, were carried out over a period of three years, the results of which are :—

(a) Suckers of 1—4 seers each give as high a percentage of success as bigger suckers; suckers of even 1 to 2 seers having done well when planted in spring.

(b) Suckers of a comparatively small size, viz., from 1 to 4 seers each give a better percentage of success when planted in spring than in autumn, while suckers of big size show equally good results whether planted in spring or autumn.

(c) Spring, is by no means a bad season for planting, February having given the best results.

Curing of Dates :—The present practice of curing dates of superior quality by individually picking each fruit in "Dung" stage (i.e., when the tip of the fruit has become translucent-brown) and spreading the same on mats in the sun till cured, is very expensive. It generally takes from 3—8 days, depending upon weather conditions, to cure dates by this method. Picking starts by the middle of July and continues till the end of August during which period each palm is climbed, several

times, to remove dates as they mature to "dung" stage. In some years, heavy showers of rain during this period spoil the fruit. The fruit is also exposed, under this method, to frequent dust-storms and insects that lay eggs on fruit. Thus the present method, besides being expensive and tedious, is also wasteful. In order to see if it could be modified, so that, without detriment to the quality of fruit, the time of curing be reduced, thus minimizing the damage by rain or dust-storms, and also whether fruit in "doka" stage (a stage 2-3 days just before the "dung") could be successfully cured, experiments on curing of dates were carried out at Lyallpur and Muzaffargarh.

Curing in the Sun :—Four varieties of dates, viz., Hillawi, Shamran, Khudrawi and Zaidi, were cured in the sun. Fruit, both in the "dung" stage as well as in the "doka" stage 2-3 days before dung stage was used. The idea of including "doka" in the experiments was to find if the "doka" fruit could be successfully cured because the picking of individual "dung" fruit from the bunch, in several visits to the same palm, is both an expensive and a tedious operation. Half of the fruit in every lot was dipped in boiling lye (caustic soda) solution (strength: varying from 0.5 per cent to 2.5 per cent) for half a minute to two minutes and then thoroughly rinsed in water to remove traces of the lye, and the other half was cured in the usual manner. The results show:

(a) dipping in 1 per cent boiling lye solution for one minute yielded very satisfactory results.

(b) the lye-dipped 'dokas' cured more uniformly, acquired a better lustre

and the general appearance was much less sticky and had a deeper brown colour than the untreated 'dokas' which had a somewhat dull pale yellow colour and were sticky;

(c) the dipped "dung" also gave a better product in colour, lustre and general appearance than the undipped one, though the difference was not so marked as in the case of 'dokas.'

(d) the undipped fruit gave a slightly sweeter product than the dipped one;

(e) the dipped 'doka' and 'dung' of Hillawi, Shamran and Khudrawi cured in about three days as compared with 5 days taken by the undipped fruit, while in the case of Zaidi the difference in time was much less. Growers are, therefore, advised to dip the fruit in a lye solution for one minute before curing, because it will reduce the time of curing to about half and thus minimizing the chances of damage by rain or dust storms. It will also improve the quality of the fruit and the product will be clean as the fruit is washed free of dirt and the eggs of insects, if any, destroyed.

Another experiment on curing dates by artificial heat was carried out in a drying box (3 ft.X4 ft. with wooden sides, lined inside with tin, and with top and bottom made entirely of tin). The box had holes for the circulation of air. The fruit was put on wire-gauze trays which were placed inside the box. Heat was applied from below by mean of a stove, the ranges of temperature tried were 120°—125° F. and 125°—130° F. The results obtained confirmed the conclusions, arrived at by drying the dates in the sun. It was also observed that the fruit, cured in the drying box, was better

than that cured in the sun. The time of curing was also reduced by about two-thirds. The range of temperature 125°—130° F. proved better than that of 120°—125° F.

The present practice of curing dates in the sun, under natural condition, which exposes the fruit to dust-storms and allows the insects to lay eggs, and subjects it to damage by occasional rains, requires modification.

The problem is still under investigation whereby, with the help of solar heat, the desired temperature along with right humidity may be maintained in a room specially designed for the purpose.

For Vinegar from dates of inferior quality, readers are referred to the chapter on fruit preservation.

Scope of date cultivation and some obstacles in its development :—Climatic requirements of dates have already been given under climatology of Punjab fruits. in this journal, and it needs no emphasis that, to a considerable extent, date is a monopoly product, like the jute, as there are only certain countries in the world where this fruit can grow such as Algeria, Tunis, Egypt, Mesopotamia, Iraq, Southern California and Mekran in Baluchistan. Fortunately there is a fairly vast area in the Punjab where this fruit can grow to almost perfection. In fact in certain districts, like Muzaffargarh, D. G. Khan and even Multan, this fruit is already of great importance and forms a considerable portion of their diet and majority of poor people in these districts largely live on dates during June, July and August.

Three districts of the Punjab, D. G. Khan, Muzaffargarh and Multan have about 20 lac female

date palms and about the same number of male palms. These are, of course, of inferior quality as compared to the varieties of dates imported by the Department from Basra. Other places suitable for date cultivation, are the canal colonies and more particularly Montgomery, Lyallpur and parts of Sheikhupura, Sargodha and Jhang districts besides the new colonies that are now being opened up.

The Government also realizes great income through the taxation of individual fruit trees. In fact, it is understood that, almost the whole of the Government revenue, in Muzaffargarh District, is paid by the people through the sale of their fruit mainly mangoes and dates.

There is also a very vast market for this fruit. India is far from self-supporting and imports every year over 50 lac rupees worth of dates from foreign countries (Rs. 53,19,904 in 1934-35). There is never any danger of over production of dates. Its consumption can be immensely increased all over India and it forms, probably, the richest diet of all fruits. There is no reason why, with the expansion of date area, Punjab should not export a large quantity of this fruit to other provinces of India and even to foreign countries.

Main Obstacle :—The greatest obstacle in the extension of date area is the shortage of young plants (date suckers). Unlike many other fruit trees where, from a few parent trees, thousands of nursery plants can be produced in a season, by budding or grafting or cuttings, in the case of date palms only a small number of plants (date suckers) can be produced from a date palm in its whole life. The

suckers come out from the parent tree largely near the ground and after 15 years or so date palm ceases to produce any suckers. It is for this reason that the Government Date Farm at Muzaffargarh and a few small date plantations in other places cannot supply more than 500—1,000 suckers a year which cannot meet even 5% of the demand from the public.

The only course for the extension of date area is to either import a large number of suckers from foreign countries for supply to the people direct or establish a big government date plantation of one or two hundred acres, mainly to serve as a progeny garden from where thousands of suckers might be supplied to the public at reasonable price. But importation of suckers of good varieties from abroad is being rendered impossible. During his visit to Egypt in 1934, S. S. Lal Singh was told by the Director of Horticulture there that Egyptian Government had passed a law prohibiting export of suckers of certain varieties. Recently the Iraq Government has also passed a similar legislation prohibiting export of suckers to foreign countries and it was this place from where the department used to import suckers. It is understood that Palestine is likewise planning to prohibit the export of suckers. In short if the suckers either for private people or for government date plantations are not imported in the near future it may become almost impossible to do so after some time.

Realising the importance of the work the Government planned last year to start a big date plantation for the above purpose and even the Hon'ble Minister for

Development made an announcement to this effect in the Annual General meeting of the Punjab Fruit Development Board but unfortunately the incidence of famine in certain districts of the Punjab prevented the government from giving effect to this decision. Now this unfortunate War might make matters still more difficult.

Apart from importing date suckers immediately from such countries which still allow the export of suckers, the other effective step that the Punjab fruit growers can take, is to make a thorough survey of our own date plantations in this province and mark out trees of outstand-

ing merit which are found here and there and then arrange to secure suckers from these indigenous date palms in a large number. If a regular survey is carried out there is no doubt that we may be able to find a fairly large number of date palms which produce fruit of good quality and which are worth propagating although they may not come to the standard of Basra dates. This work of surveying the date plantations can be taken up either by the fruit growers, Associations or by the government with the full co-operation of the public. The sooner this work is in hand the better.



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The Phalsa (*Grewia Asiatica*)

by

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Fruit Specialist, Punjab

and

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1. Scope for cultivation and Juice making.—The Phalsa is perhaps the hardiest of all fruit trees. It can grow on soils where other fruit trees fail to grow. It can do with a small amount of irrigation and manure, and the severe pruning, to which it is subjected, renders it comparatively free from serious diseases. Its negligible initial cost of planting, its coming into bearing in about two years only, and the fact that the juice of its fruit provides a cooling and refreshing summer drink, offer a great scope for its cultivation, especially near big cities. The information about its cultivation can be had by referring to leaflet No: 114 published by the Department of Agriculture. An average yield of 10.5 lbs of fruit per bush, obtained during the period of six years (1931-1936) at Lyallpur, works out at over 50 maunds of fruit per acre (435 plants per acre) which, at the rate of even Rs. -11/6 a seer, would yield an income of about Rs. 200 per acre. But the rate of fruit per seer had been, on the average, about -13/- at Lyallpur during 1931-1936.

The demand for this fruit is limited at present but the manufacture of phalsa

Juice and Syrup should open up a wide market for it. The method devised at the Fruit Preservation Laboratory, Lyallpur for preparing the Phalsa Juice and Syrup has been published in leaflet No: 115 of the Department of Agriculture. The method of preparing the juice is now being still further improved.

2. Pruning of the Phalsa.—There being a considerable difference of opinion, amongst the growers, regarding the pruning requirements of this fruit tree experiments were conducted at Lyallpur, over a period of six years (1931-1936) to investigate the effects of various degrees of pruning on its vigour and fruitfulness. The results of these experiments, in detail, have been published already in the Indian Journal of Agricultural Science, Vol: VIII; part III; June, 1938; pp 319-330. However, for the benefit of the readers of this journal, they are also given below, in a summarised form.

The degrees of pruning tried, were.—

(1) **Severe pruning**, viz, cutting the bushes close to the ground, in winter as widely practised by growers in the pro-

vince. (2) **Moderate pruning**, viz, cutting the bushes at $1\frac{1}{2}$ -2 feet from the ground, thus providing a little Frame-work for the new shoots, and (3) **Light pruning** viz, cutting the bushes at $3\frac{1}{2}$ -4 feet from the ground, thus leaving a better frame-work than in the case of moderately pruned bushes. Besides, a few bushes were also left unpruned. The results on the yield of fruit, and the number of new shoots induced by different methods of pruning show that bushes, cut back at $3\frac{1}{2}$ -4 feet from the ground level, invariably gave the highest yields and produced the largest number of new shoots. The average yield for the six years (1931-1936) came to $3\frac{1}{2}$ lbs, 5 lbs. and $10\frac{1}{2}$ lbs. per bush for severe, moderate and light pruning methods respectively. It may be added that the increase in yield, in each case, was in proportion to the number of new shoots produced.

The unpruned bushes did not exactly follow the response shown by pruned bushes. They produced, on the average, about 8 lb. of fruit, viz, less by about $2\frac{1}{2}$ lb. per bush as compared with the light pruned bushes, but the number of new shoots produced was higher. The

decreased efficiency for production of the new shoots in this case, may be explained as being due partly to their shorter lengths and partly to the weakened wood. Besides this, another great disadvantage in allowing the Phalsa bush to grow very tall (as by keeping them unpruned) is that the cost of picking the fruit goes very high, which is perhaps the highest item of expenditure in its cultivation.

It is evident, therefore, that the light pruned bushes, viz., those cut at $3\frac{1}{2}$ -4 feet from the ground every winter, gave the largest amount of fruit per bush, and produced the right type and amount of new wood. However, it should be noted that these results are applicable only when the distance to be kept between the bushes is 10 feet each way.

Further pruning and spacing experiments are in progress with a view to find out the spacing requirements for other degrees of pruning and vice versa. After a few years we shall be in a position to recommend not only the proper distance for the most prevalent system of pruning (severe pruning), but also to say definitely which one to adopt in orchard practice.

BANANA

by

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Fruit, Specialist, Punjab.

Banana :—Practically throughout the province, one finds a few clusters of bananas in almost every garden. In some localities, such as Amritsar, they are grown even on a commercial scale. But the variety grown throughout the province is of extremely poor quality; the pulp of the fruit being rather sticky and devoid of flavour, and bears no comparison with the fruit imported from outside. In fact, it is doubtful, if the Punjab would ever become an important banana growing tract because a study of banana growing tracts like Hawaiian Islands, Malaya States, Ceylon, Calcutta, Madras, Bombay, etc., shows that banana relishes hot humid atmosphere free from severe frost, and a very rich soil with a plentiful supply of manure and water. In the Punjab, hot dry winds accompanied by frequent dust storms scorch the fruit and damage the plants in summer while severe frosts frequently kill the plants in winter. Shortage of rainfall as well as irrigation water in canals at certain critical times also adds to the difficulties. With a view to find out some suitable variety for the Punjab, detailed observations were made on the yield for a period of over five years and characters of about 85 varieties (given in the appendix) introduced from Bombay, Madras, Ceylon, Malay States, etc. The following types of both the culinary and table varieties appear to be promis-

ing in the years when they escape from the above mentioned climatic disabilities. The Department does not as yet recommend cultivation of banana on commercial scale although there is no harm in planting a few for home consumption.

TABLE VARIETIES

1. **Puttubala** :—Plant short statured and stout; fruit of yellowish colour; 4.2" long and 3.3" in girth; skin of medium thickness; peels off readily; pulp soft and slightly sticky but of good taste and pleasant flavour.

2. **Dwigosha** :—Plant dwarf and stout; fruit yellow; size 4.5" in length and 4" in girth; skin medium in thickness and peels off readily; pulp delicious and of pleasant flavour.

3. **M. Murtaban** :—Plant of medium height; fruit 3.5" in length×3.5" in girth; skin thin and peels well; pulp of good flavour; sweet.

4. **Yelakhibala** :—Plant medium in height; slender; bunches: small to medium in length; fruit 3.1" long and 3.8" in girth; very marked and pleasant in flavour, flesh soft and skin adheres to pulp.

5. **M. Champa** :—Plant tall and upright in growth; slender bunches usually long and handsome, fruit 4.2" long and 5.2" in girth and well filled; best flavour-
ed but slightly sticky.

when over-ripe; pulp firm, sweet, due to firmness of pulp it is not attacked by insects; picking season from beginning to end of April. Average yield per year for the last four years, viz., 1936 to 1939 works to 12 maunds, 35 seers and 10 chks. The fruit sells @ -11/6 a seer.

Another advantage in the case of this variety is that it is very resistant to frost.

A note discussing the topworking of wild ber trees growing in millions throughout the province appears on page 634.

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Acacia Decurrens	...	Rs. 8 0 0		
Ghiricidia Maculata	...	Rs. 3 0 0		
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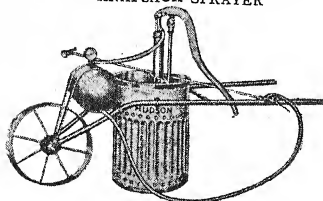
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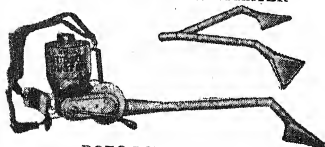
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Treating Wooden Stakes with Preservatives

by

S. S. Lal Singh, B.Sc. (Hons.), M.Sc. (Calif.),
Fruit Specialist, Punjab.

The damage done by white ants in practically every part of the province is proverbial. A large number of wooden stakes that are used for fencing as well as supports for vines and trees, are destroyed very soon and they have to be replaced very frequently.

Various kinds of wood preservatives are no doubt advertised but very few fruit growers really use any wood preservatives with the exception perhaps of coal tar and solignum here and there. The usual method is to brush the preservative roughly over the parts of the poles that come in contact with the soil. An experiment carried out, by the Fruit Section shows that it is absolutely neces-

sary to treat wooden poles. It was noticed that poles merely brushed with coal tar or solignum proved as susceptible to attack as those untreated. The best method is to immerse the poles in a hot wood preservative for about half an hour after which they may be dried thoroughly and then planted. Of course, only that portion of the pole need be treated which has to remain under ground. Great care should be taken not to damage the treated portion of the pole as the removal of the preservative even from a small portion would expose it to the attack of white ants. The poles should preferably not be driven into the ground, but planted in holes previously dug for them.

Chapter on Fruit Preservation

By

S. S. Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.),

Fruit Specialist, Punjab

and

Dr. Girdhari Lal, Ph.D. (Lond.),
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Importance of Fruit Preservation Industry in the Development of Fruit Farming.—Fruit Preservation was the subject of a talk broadcast from Lahore Radio Station, some time ago by S. S. Lal Singh, Government Fruit Specialist, which has already been reproduced in the Punjab Fruit Journal Vol. 2 No. 7, 1938. This talk dealt with,

- (a) the origin of fruit and vegetable preservation industry;
- (b) extent of this industry in foreign countries;
- (c) imperative need of developing fruit preservation industry along with fruit farming in this country;
- (d) products for which there is scope in the Punjab; and
- (e) ways and means to encourage the industry.

These aspects of the industry need hardly be repeated here; but it is highly desirable that emphasis should be laid on a few salient features of the problem. For instance, in every garden there is always a fair proportion of second and

third grade fruit which fetches very poor returns to the growers and does not even cover the picking and transporting charges. In foreign countries, this type of fruit, along with the surplus fruit of good quality which cannot be profitably disposed of in the fresh fruit market, is utilized in the manufacture of various fruit products. This procedure is practically the back bone of the fruit farming industry of these countries and is worthy of emulation.

It is known to the readers that acreage under various fruits is now gradually increasing in the Punjab, with the result that the prices of fresh fruit are decreasing day by day and the growers are already finding difficulties in disposing of their second and third grade fruit profitably. It will be of interest to the readers to know what steps are being taken by the Punjab Agricultural Department to encourage fruit preservation and to help the prospective fruit preservers by various methods such as:—

- (a) offering facilities for training in this line both on home scale and commercial scale;

- (b) carrying out experiments on the preparation and standardisation of various fruit and vegetable products;
- (c) working out the economics of various products on semi-commercial scale, etc.
- The above activities in the line of fruit preservation are briefly described in the following pages.
- It may be mentioned that arrangements exist for imparting training in Fruit and Vegetable preservation both on home and commercial scale. Various courses given in the subject are discussed on page 615 under "Facilities for training in Fruit Culture and fruit preservation."

FRUIT PRESERVATION RESEARCH-WORK DONE IN THE FRUIT AND VEGETABLE PRESERVATION SCHEME JOINTLY FINANCED BY THE PUNJAB GOVERNMENT AND THE I. C. A. R.

Fruit farming can be profitable and can maintain a continued progress, if first-class fruit is placed in the market, whether local or foreign, and inferior fruit is utilized for various by-products in a way that it would fetch a decent income to the grower. In the Punjab, Fruit and Vegetable preservation industry has received a good deal of attention of the Agricultural Department since the advent of Fruit Section in 1926 at the Punjab Agricultural College, Lyallpur. From 1926 to 1934, the activities of the Section were mainly confined to imparting instruction in the subject to 'short course' classes and experimental work on small scale, on the preparation of various fruit and vegetable products.

Due to lack of appropriate staff and funds, full justice to the experimental work could not, however, be done. At the same time short courses mentioned above, had created a great awakening amongst the people, and need was ultimately felt to extend the activities in the direction of research work. Hence a special scheme on the preservation of

fruits and vegetables was submitted to I.C.A.R. (the Imperial Council of Agricultural Research), which during its short existence has rendered such a valuable service to the agriculture of the country. The work on the scheme was started in November, 1934, and is still in progress. It is financed both by the Punjab Government and the I.C.A.R.

Before giving the experimental work carried out under this scheme, it may be mentioned that satisfactory methods for the manufacture of the following products have already been evolved; the quality of the products comparing favourably with the similar foreign products, found in the Indian market.

- (1) Orange squash.
- (2) Lemon or Lime squash.
- (3) Lime juice cordial.
- (4) Tomato ketchup.
- (5) Tomato Juice.
- (6) Canned pears.
- (7) Pear jam.

- (8) Lemon Barley water.
- (9) Orange marmalade.
- (10) Mango squash.
- (11) Plum jam.
- (12) Unfermented apple juice.

- (6) Peel oil.
- (7) Citric acid.
- (8) Vinegar.
- (9) Wines.
- (10) Pectin.
- (11) Dehydrated or dried citrus peels
(for flavouring purposes)

Since, for want of space, it is not possible to give all the details about the preparation and standardization of various products mentioned above and other allied problems connected with the preservation of fruits and vegetables, only a brief account of the more important problems is given below. But the readers, interested in the industry of Fruit Preservation or in the manufacture of any particular product whether on home scale or commercial scale, are welcomed to secure further information from the Fruit Specialist, Punjab, Lyallpur.

I. CITRUS PRODUCTS

Area under citrus fruits in the Punjab has steadily increased during the past few years, and the problem of profitable disposal of fruit is already becoming very acute especially in the case of second and third grade fruits which do not find a ready sale in the fresh fruit market. Such fruits can be used with advantage for the manufacture of the following citrus products which are given in order of their importance.

- (1) Citrus fruit squashes and cordials.
- (2) Juice concentrates.
- (3) Natural unsweetened juices.
- (4) Marmalade.
- (5) Candied peel.

Time and facilities so far, have permitted detailed work on items 1—5, viz., squashes and cordials, concentrates, natural unsweetened juices, marmalade and candied peels. Preliminary work on the preparation of citric acid from galgals has also been started.

1. Citrus fruit Squashes & Cordials:

(a) Satisfactory recipes have been evolved for the manufacture of orange (Malta) squash, lemon squash, lime squash, and lime juice cordial. Detailed work in this respect has already been published by Messrs. Lal Singh & Girdhari Lal in the Indian Journal of Agricultural Science vol. VIII, part I. 1938 and is obtainable from the office of the Fruit Specialist, Punjab, Lyallpur, at Rs. -4/6. In this paper recipes for the preparation of above mentioned products have been given. Various types of machinery suitable for small and large scale production have also been included. And the Cost of production has been worked out.

Brief methods of preparation and recipes of these squashes and cordials have also been separately published by Girdhari Lal in the Punjab Fruit Journal Vol. I. No. 2, 1937. The above methods have now been published in popular language in the Departmental leaflets No. 153 (for Lemon or lime squash and

lime juice cordial) and 155 (for orange squash).

(b) Certain aspects of the problem of preparing squashes which could not be handled previously are now under investigation and are given below :

- (1) Use of essential oil in squash making, to improve flavour.
- (2) Blending of various citrus juices to obtain a desired fruit squash.
- (3) Maturity of oranges at different intervals during the season as affecting the quality of squash.
- (4) Effects of addition of different types of essences to malta orange squash to improve its flavour.
- (5) Experiments to improve the colour of malta orange squash.
- (6) Further improvements in the quality of squash from Nagpuri sangtras and also from Desi Sangtras (loose oranges).

The above experiments have been in progress for over a year; encouraging results have so far been obtained. Some aspects of these problems are being further studied.

2. **Citrus Marmalade.**—Satisfactory recipes for the preparation of marmalade from Khatas and galgals alone and by mixing varying proportions of these with malta oranges have been evolved.

3. **Orange-peel candy.**—With the rapid progress which is being made in the manufacture of orange squash and lemon squash, in our province, it is essential to find a suitable outlet for the peels (skins) of these fruits which go to

waste at present. Experiments in this laboratory have been conducted in evolving a satisfactory method which can be successfully used for candying orange-peels which at present are imported in India. An excellent product has been made, the quality of which has been very favourably commented upon by distinguished visitors who came off and on to visit our laboratories.

4. **Other Experiments on Citrus products.**—Experiments on the following have been conducted and satisfactory results have been obtained. Some aspects of these problems are still under investigation.

(i) **Lemon Barley Water.**—Experimental work on the preparation of lemon barley water has indicated that local (desi) varieties of barley yield as good a product as that obtained by the use of imported barley and barley flour. A satisfactory recipe has been evolved and will soon be published.

(ii) **Nutritive value (vitamin C) in Squashes.**—Retention of vitamin contents of a fruit product depends mostly on the methods of its preparation and subsequent storage life of the product. Estimation of vitamin C (during storage) in orange and lemon squash, prepared and preserved in different manners, has given very interesting results which will shortly be published.

(iii) **Canning and bottling of concentrates from lime, lemon and malta orange juices.**—This problem is of very great importance for the aerated water bottlers and the consumers of the aerated drinks in this country, as the synthetic stuff (consisting of carbonated water, saccharine and artificial flavour which have

not got any food value) can be successfully replaced by these pure fruit juice concentrates. It hardly requires a prophet to foresee what tremendous benefit will accrue both to the fruit growers and to the general public, if in tens of crores of aerated water bottles, bearing fanciful names of lemonade, orangade, banana, strawberry or fruit crushes, etc., real fruit juice in concentrated form were used instead of the artificial colour and flavour and saccharine.

(iv) **Natural unsweetened juices.**—Health giving properties of pure fruit juices are already well-known to the people of this country now; hence the importance of this problem can hardly be over-emphasised. Since most fruit juices have very delicate flavour which easily volatilizes or deteriorates rapidly in storage, this subject requires detailed study which is in progress.

(v) **Method of determining real fruit juice content of a squash or a syrup.**—Evolution of such a method will definitely help the manufacturers of genuine fruit syrups and squashes as well as the consumers. Since such a method will show the amount of real fruit juice in any product it will give a great set back (which is very desirable) to the manufacture of synthetic syrup and squash (which have absolutely no food value). A very large quantity of these is put in the market at present. A method for determining the real fruit juice content of a syrup or a squash has been developed and the entire data collected would shortly be published.

(vi) **Citrus by-products given under items 6 to 11 on page 695.**—Work on

the preparation of citric acid and pectin from galgal juice has only recently been started and will require a good deal of further studies to put forth any definite results. Work on other items is still a matter of further investigation.

II. TOMATO PRODUCTS

Tomatoes in the Punjab, are specially abundant in April, May and June and can be purchased in the mid-season at extremely low prices varying from As. -12/- to Re. 1/- per maund in the important markets of the Punjab. Such cheap fruit can be converted into products like tomato ketchup and tomato juice which are already in favour with the Indian tastes, and can be a source of good profits to the growers as well as the manufacturers.

(a) **Tomato ketchup.**—After a good deal of experimentation, a satisfactory method for the preparation of tomato ketchup has been evolved. This method has been published in the following publications :—

- (1) A Special Bulletin, published by the Department of Agriculture in 1936; priced at Rs. -4/-.
- (2) A Special Bulletin, published by the Imperial Council of Agricultural Research, New Delhi.
- (3) A departmental leaflet: No. 77.

(b) **Tomato Juice.**—After a good deal of experimental work, the method of manufacture of tomato juice has been evolved. The product has been very greatly appreciated by high Government officials, grocery dealers and others. An interesting feature of the

manufacture of this product is its extremely low cost of production which works out to be about Rs. -[4]- to -[5]- per 24 oz. bottle; whereas the imported juice sells about 1[4]- a bottle. The method of preparation and preservation has been published by Dr. Girdhari Lal in the Punjab Fruit Journal, Vol. I; No. 3; (1937).

III. PEAR PRODUCTS

1. **Canned pears.**—Excellent pears are grown in Kulu Valley which fetch extremely low price varying from Rs. -[8]- to Rs. 1[8]- per maund. The actual price paid by us this year on the average, was Rs. -[12]- a maund, for good fruit. For the benefit of growers and prospective manufacturers, any suitable outlet for such cheap fruit was worthy of consideration. With this end in view experiments have been conducted (a) to find out the best canning variety (William's pear has been found to be the best canner), and (b) to determine the right time of picking of these pears for canning and (c) to determine the right method of canning. Results of these investigations are being compiled for detailed publication. A satisfactory method for the manufacture of canned pears has been evolved; the product has been found to compare very favourably with the imported stuff and is given by Girdharilal in the Punjab Fruit Journal Vol. III, No. 12, 1939, and the departmental leaflet No. 154.

2. **Pear Jam.**—Experiments on the preparation of pear jam were conducted on different varieties of pears by using varying amounts of sugar and acid and finally a satisfactory recipe has been evolved.

An article on "Semi-Commercial" trials on the manufacture of canned pears and pear jam has already been submitted for publication to the Imperial Council of Agricultural Research.

IV. MANGO PRODUCTS

Seedling mangoes, i.e. produced from seeds of fruit grafted plants are grown in very great abundance in the Districts of Hoshiarpur, Gurdaspur and Kangra. The fruit is so cheap in certain years, that sometimes it does not pay the growers even to pick the fruit and cart it to the market. This fruit has been successfully used for the preparation of mango squash and dried mango juice (Am-pappar).

1. **Mango Squash.**—Mango squash has been found to be an excellent beverage. Recipe for the preparation of this product has been worked out and will soon be available for publication.

2. **Dried mango juice.**—An excellent sample of dried mango juice (Am-pappar) has been prepared; cost of production of this product prepared on a small scale is rather high; further work for finding out the cost of manufacture on a large scale is still required to be done.

3. **Canned Mangoes.**—In the Punjab, canning varieties of mangoes are not available and as there seems to be good demand for this product in the Indian market, six grafted varieties of mangoes imported in the Punjab markets, from other provinces in India, have been tried for canning. Two varieties namely Sarholi and Safaidda have been found to be excellent canners.

V. APPLE JUICE PRODUCTS

1. Excellent apples are grown in Kulu Valley, and a fair proportion of the crop—like wind falls, blemished, misshaped fruit, which is unfit for sale for table purposes—goes to waste, but can be used for products like unfermented apple juice, apple vinegar and apple cider.

(a) **Unfermented Apple Juice.**—A satisfactory method has been evolved for the preparation of natural unfermented apple juice from two varieties of apple, viz., yellow Newtown Pippin and Baldwin—varieties which are most commonly grown in the valley. Detailed investigation, giving the methods of clarification, methods of manufacturing clarified (in which the tissues and natural suspensions have been removed) and unclarified (natural) juice, has already been submitted to the I.C.A.R. for publication.

(b) **Apple Vinegar.**—Preliminary experimental work on the preparation of apple vinegar has given encouraging results. Fermentation by wild yeast (spontaneous fermentation with the aid of yeast and bacteria present in air) has given a product which varies in composition. Experiments on fermentation under controlled conditions (by inoculating the juice by pure strains of yeast) are in progress.

(c) **Apple Cider.**—Cider varieties of apple are not grown in Kulu Valley, but experimental work on Yellow Newtown Pippin and Baldwin apples (both are good dessert varieties) has shown that cider of fairly good quality can be made from these varieties.

VI. JAMS AND JELLIES

1. **Plum Jam.**—Plums, while in season, in the Punjab, can be had at fairly cheap prices and have been found to give a jam of excellent taste and flavour. After a good deal of experimentation by varying the amounts of sugar and acid, required for getting a desired product, a satisfactory recipe for preparing this product has been evolved.

2. **Guava Jelly.**—Guavas are known to possess an excellent characteristic flavour and aroma which is very stable in its nature. They usually lack the appropriate amount of acidity, required for jelly making. Excellent jelly, by using definite amounts of standard citric acid solution, has been prepared and the product has been found to retain excellent flavour and aroma during storage.

VII. JUICES FROM SUMMER FRUITS

In the summer season falsa (*Grewia Asiatica*), Jamans (*Eugenia Jambolana*) and grapes, are found in fair quantity, in the Punjab markets. These fruits in mid-season can be purchased at fairly reasonable prices and can be used for the preparation of juices which are known to be very refreshing and cooling (particularly Jaman and Falsa juices and syrups) in the hot summer months of the Punjab plains and also possess a fair amount of food value. Hence the investigations on the preparation of juices and syrups from these fruits are worthy of consideration.

(a) **Jaman (*Eugenia Jambolana*) Juice and syrup.**—Experiments have been conducted during the last two or three seasons and ultimately jaman juice and syrup have been successfully packed. The

product has been found to behave wonderfully well during storage.

(b) **Falsa (*Grewia Asiatica*) juice and syrup.**—The retention of flavour in the case of falsa juice and syrup is rather an intricate problem. Attempts in various directions to preserve these products satisfactorily have not been yet successful. Further experiments in this direction are still in progress.

(c) **Grape-juice.**—No experimental work on juice from Quetta grapes has been undertaken, but a satisfactory method has been evolved, of preparing grape juice by blending juices from a few varieties of grapes grown locally in the experimental garden at Lyallpur. The method of preserving this juice can undoubtedly be practised in the bottling of juice from Quetta grapes.

VIII. OTHER EXPERIMENTS

Experiments on the following have also been conducted. Due to lack of space, only the headings of experiments are given —

- (i) Canning and Bottling of peas.
- (ii) Canning of grape fruit.
- (iii) Candying of Bers (*Ziziphus Jujube*).
- (iv) Drying and Dehydration of Apples.
- (v) Plum juice and syrup.

Note :—It may again be pointed out to the readers that the experimental work referred to above is financed jointly by the I. C. A. R. and the Punjab Government and this can only be published in detailed form after the same has been finally approved by them. So, partly for this reason and part-

ly due to lack of space in the Journal, only a brief outline of the work is given to acquaint the readers with the type and nature of work being conducted and the successes so far achieved. Those interested in the Fruit Preservation industry are welcome to have any further information on these problems from the Fruit Specialist, Punjab, Lyallpur.

IX. OTHER EXPERIMENTAL WORK CARRIED OUT IN THE SECTION

(i) **Date vinegar** :—A large amount of fruit goes to waste, every other year in the date growing districts as a result of damage caused by rain at the time when the fruit is ripening. The utilization of this waste fruit is a matter of great economic importance to date growers. During 1931 about 500 lbs. of this waste fruit was used in five different lots for making vinegar. Juice was extracted by pressing the fruit, under weight, after boiling the same for an hour, in an equal amount of water. Similarly, two more extractions were taken from the fruit used above. The juice from these three extractions was mixed and subjected to alcoholic fermentation by the addition of actively fermenting juice (1/10th by volume of the whole juice). On the completion of the alcoholic fermentation, the fermented juice was siphoned off and then subjected to acetic acid fermentation by an addition of 10 per cent unpasteurized mother vinegar. When the fermentation was complete, the vinegar was pasteurized and stored for several months, in air tight containers, to age, before it was bottled. The important conclusions drawn from this experiment are :

- (1) that the juice of about 15° B gave a standard vinegar of 5 per cent acidity. The strength of vinegar would have been greater, had the acetic acid fermentation immediately followed the alcoholic fermentation. It was delayed because of the late arrival of mother vinegar;
 - (2) that the alcoholic fermentation was completed within a week's time, at an optimum temperature of 80° to 90° F. and the acetic fermentation was completed in about a month, in the presence of a free supply of oxygen;
 - (3) that although the amount of juice and its Balling degree considerably vary according to the degree of the ripeness of fruit, its quality, the extent of fermentation already set in the fruit and the variety of fruit, etc., yet it is safe to state that juice of about 15° Balling would be equivalent to 1½ to 2 times the weight of the fruit used;
 - (4) that 12—15 gallons of standard vinegar can be obtained from 100 lbs. of fresh fruit, i.e., 9—12 gallons per maund of fruit. The yield of vinegar from the dried or cured dates would of course be higher on account of greater concentration of sugar in the fruit. This experiment has been repeated since then, and results have been confirmed.
- (ii) **Vinegar from molasses** :—With the rapid development of the sugar industry in the Province, profitable disposal of molasses is becoming a problem. At present the molasses is being either disposed of at a ridiculously low price or is thrown away. So with a view to find out some profitable way of its disposal, vinegar was prepared from it in 1934 and 1935, by diluting it five times in order to obtain the desired concentration of 15°-16° B. The solution was then pasteurised at 175° F., cooled and poured into wooden barrels. It was then subjected first to alcoholic and then acetic acid fermentation which was completed within a period of three months at a temperature ranging between 70° and 83° F. The finished product contained 4.5 to 5 per cent acidity expressed as acetic acid. From these trials, it was estimated that a maund of molasses would yield about 200 bottles (one bottle with 24 oz. capacity).
- (iii) **Grape-Wine** :—There are a good number of varieties of grapes being grown at the experimental garden at Lyallpur, and a fair amount of third grade fruit is available in the season. Such fruit from all varieties was collected in the year 1935 and collectively crushed. The juice obtained was filled in wooden casks and inoculated with definite strain of wine yeast; and the following types of grape wines were ultimately obtained.
- (a) Heavy dry—contained about 16.0 per cent alcohol and no sugar.
 - (b) Light dry—contained about 7.0 per cent alcohol, and no sugar.
 - (c) Heavy Sweet—contained about 16.0 per cent alcohol, and sugar just enough to sweeten to the desired taste.

- (d) Light sweet—contained about 7.0 per cent alcohol, and sugar just enough to sweeten to desired taste.

These wines have been in store for the last four years and light sweet and the heavy sweet types have developed excellent taste and flavour.

CANNERY AND JUICE MANUFACTURING PLANT

It will interest the readers to know that facilities have now been provided for the semi-commercial production of various fruit and vegetable products at the fruit section, Lyallpur.

A Canning Hall fitted with up-to-date machinery for the manufacture of various products is the result of a special grant of Rs. 15,000 given by the Government of India out of Rural Reconstruction grant. Besides this, there was a considerable amount of machinery already available in the Fruit Preservation Laboratories. A complete plant for the manufacture of juices, squashes, cordials, etc., at a cost of about Rs. 7,000/- has also been recently installed. Thus it is one of the premier institutes in India where up-to-date facilities exist for the manufacture of various fruit products on semi-commercial scale.

The objects of the Canning Hall and the juice plant are :

- (a) Methods of preparation of various fruit products which are standardized from time to time under the fruit and vegetable preservation scheme of I.C.A.R., are tried for the manufacture of these products on semi-commercial scale.
- (b) Complete data regarding cost of raw material, containers, labour, etc., are recorded and the cost of production of each product

worked out. The information, thus, collected, is made available to the prospective manufacturers of any particular product.

- (c) During the preparation of the above mentioned products in the Canning Hall and juice plant, students of the "Advanced course in fruit preservation" also get the necessary training. It also serves the purpose of demonstration to many visitors who come to see the same.

It will perhaps interest the readers to know the details of various units with other miscellaneous machinery utilized in the preparation of various fruit and vegetable products. The details of two special units, viz., canning, and juice making plants are given below.

1. Canning unit

- (i) This unit comprises (a) a syru-per or brine tank, (b) Exhaust box, (c) Cooking tank, (d) Cooking retort (for vegetables) and (e) cooling tank. Necessary steam and water connections to items a, b, c, and d are provided. A steam boiler is also installed for feeding steam to the above machines.

This unit has a capacity of turning out 2,000 cans per day.

(ii) Can-reforming unit

- This unit comprises (a) A body reformer, (b) A flanging press, and (c)

A double seamer. These machines have a capacity of making 500 cans per day.

2. Juice and Squash making Plant

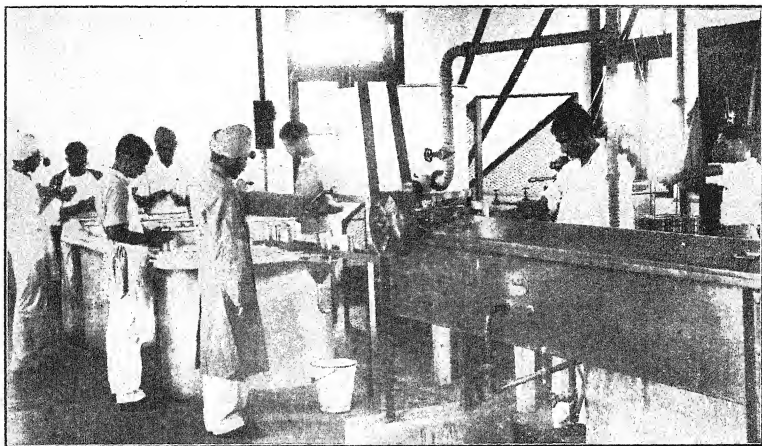
This plant consists of (a) Rosing machine for extracting juice from oranges and lemons, (b) Pulping machine for uniformly mixing the juice sacs in the juice, (c) Syrup maker and filter, (d) Bottom Agitating tank for mixing sugar syrup and juice, (e) Fruit juice pump for pumping juice from the pulping machine to Agitating Tank.

This unit has a capacity of making 1,200 bottles (one bottle with 24 oz. capacity) per day.

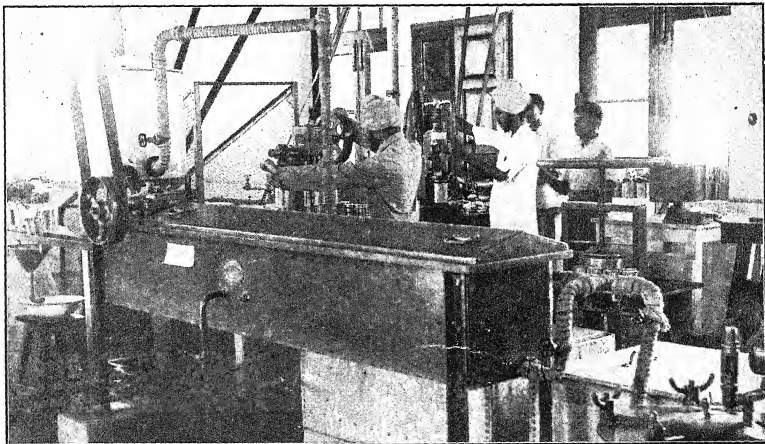
The prices of the above units and the source from which they are available along with similar information for other miscellaneous machinery, used in the Fruit Section, Lyallpur, for the manufacture of various fruit and vegetable products, are given below. It is hoped that such information will prove useful to the readers.

LIST OF MACHINERY, ETC., USED FOR PRESERVING FRUITS AND VEGETABLES, AT LYALLPUR

Name of Machine.	Price	Available from :
1. Canning plant including :—	Rs. 2,440	Messrs. Mather Platt Co. Ltd., Calcutta.
(a) Exhaust box		
(b) Syrup tank		
*(c) Cooking tank		
*(d) Cooling tank		
(e) Cooking retort (for vegetables)		
2. Can Reforming Unit including :—	Rs. 1,400	Metal Box Co. Ltd., Calcutta
(a) Body Reformer		
(b) Flanging press		
(c) Double Seamer		
3. Cochranette Boiler with freight, etc.	£96-18-9	Cochran & Co. Ltd., Anan, Scotland, England.
*4. Rosing machine with two roses, belt drive, aluminium covers, aluminium roses	Rs. 435	Messrs. Gardners' Juices (India), Lyallpur.
5. Fruit juice pump with self-contained meter	Rs. 662	do.
6. Pulping machine stainless steel body and sieve, fast and loose pulleys for fruit pulp smashing and tomato pulping	Rs. 1,748	do.



Students of Advanced Fruit Preservation Class canning Pears in the Fruit Canning Hall, Punjab Agricultural College, Lyallpur.



General view of the Canning Hall showing Can Reforming Unit in operation.

7. Syrup maker and filter 50 gallon	Rs. 2,110	Messrs. Gardeners' Juices (India), Lyallpur.
8. Bottom agitating pan 50 gallon	Rs. 1,260	do.
*9. Syphon pipe filler, four pipes of stainless steel, wooden tank and trough agitating device	Rs. 332	do.
10. Hydraulic Juice Press	Rs. 495	do.
11. Pea Podding Machine	Rs. 910	Messrs. Mather Platt Co. Ltd., Cal- cutta.
*12. Hand Screw Juice Press	Rs. 45	Messrs. Gardners' Juices (India), Lyallpur.
13. Orange Juice Extractor, Table Model	Rs. 14	do.
*14. Hand Grape Crusher	\$50.00	Anderson Barngrover Manufacturing Co., 20-22 Fremont St., San Fran- cisco, California, U. S. A.
*15. Hand Apple Grater	\$75.00	
*16. Iron Filter stand	\$ 3.25	
*17. Vacuum Can Tester	\$ 7.00	
18. Cuber & Slicer	\$50.00	
*19. Sterling Slicer No. 40	\$71.00	
*20. Sterling Slicer No. 20	\$20.00	Not sold by the Company but can be had on hire @ £5/- a year from Sutax Capping Machine, Sutax Ltd., Gardiners House, 10-14 Charter House Street, London, E. C. 1.
21. "Sutax" Capping Machine :—		
22. Automatic Quick Change Can sealer	Rs. 95	Messrs. Gardners' Juices (India), Lyallpur
23. Quick Change Can Sealer	Rs. 90	do.
24. Simplex Can Sealer	Rs. 97	do.
25. Universal hand crown corking machine table type	Rs. 85	do.
26. 10-Gallon Steam jacket- ted Copper kettle, less cover	£30	Anderson Barngrover Manufacturing Co., 20-22 Fremont St., San Francisco, California, U. S. A.
27. French type steam jacket- ted aluminium kettle cap. 10 gallons	\$160.00	
28. Pressure Cooker	Rs. 90	Messrs. Gardners' Juices (India), Lyallpur.
*29. Coring knives	Rs. 12 a dozen	do.

*30. Pitting knives	Rs. 12 a dozen	Messrs. Gardners' Juices, (India), Lyallpur.	
*31. Peeling knives	Rs. 12|12 a dozen	do.	
*32. Tomato Trimming knives	Rs. 12|12 a dozen	do.	
33. Centrifuging machine for centrifuging juices	Rs. 45	do.	
34. Electric Juice Extractor (Mix Master)	Rs. 98	do.	
*35. Hand juice Extractor	Rs. 6|8	do.	
*36. Hand wheel-work juice Extractor	Rs. 35	do.	
37. Upright vinegar generator	\$45.00	Anderson Barngrover Manufacturing Co., 20-22 Fremont St., San Fran- cisco, California, U. S. A.	
*38. Grape & Tomato crusher	Rs. 165	Messrs. Gardners' Juices, (India), Lyallpur.	
*39. Filter Stand	Rs. 12	do.	
*40. Hot-lift Tongs	Rs. 4	do.	
41. Swedish Fine Glass juice extractor with 2 cones for lemons and oranges	Rs. 13	do.	

NOTE.—For latest quotations please always correspond with the above mentioned firms. Items, marked* are, however, very simple devices, and can be got locally made at fairly reduced prices.

NATIONAL MARK SCHEME

In order to put a stop to the indiscriminate manufacture of inferior and in most cases synthetic fruits and vegetable products, it is essential that some sort of control should be kept on the manufacture of fruits and vegetable products in this country, so that the quality of these products is maintained at a certain standard. At present there is a great dissatisfaction amongst the manufacturers of genuine fruit products who are experiencing difficulties in pushing their products in the market, in competition with the inferior and synthetic stuff which is found in large quantities in the market in these days. The extreme importance

of adequate standards is enhanced in the case of any new product introduced in the market as the imposition of standards is more satisfactorily affected at the preliminary stage of a new industry than later on when industry may have adopted itself to inferior and lower standards of manufacture.

It may perhaps interest the readers to know that in most of the countries in the world—particularly U. S. A.—there have been framed definite food-laws for all types of packed foods, the breach of which is punishable with heavy fines. Although it is perhaps an extreme mea-

sure to enforce such laws, but all the same it is the best way to encourage genuine industries.

In other countries (like England) there are in vogue, voluntary systems under which the manufacturers have to purchase labels for their products from the Government which lays down definite standards, and the purchasers of such labels have to market only the products conforming to these specifications. Under this system the manufacturers are practically under the control of the authority issuing the labels who test their products, off and on, to see whether the products put in the market under these labels come up to the prescribed standards. There is also a very efficient inspection service for looking into the cleanliness of the factory premises and hygienic packing of the products, etc., etc. Such a system is a great boon both to the consumers (as they know they would be buying a genuine and a standard product), as well as to the manufacturers, as they have not to compete with the third class inferior stuff.

In view of the above facts, in 1937, a detailed scheme (covering about 15 type-written pages) of National Mark system (similar to that prevalent in England) laying down standards and specifications for squashes, jams, jellies, marmalades, canned fruits and vegetables, use of permitted preservatives, and colouring matters, etc., was submitted to

PLEA FOR A CENTRAL INSTITUTE FOR TRAINING IN FRUIT PRESERVATION

With the impetus given by the I.C.A.R. and the Provincial Governments, for the development of fruit industry in India, the question of fruit preservation and manufacture of fruit by-products has

the Punjab Government, which in turn forwarded the same to the Agricultural Marketing Advisor to Government of India. This was discussed by a sub-Committee which recommended to give effect to the citrus products scheme for the present and also advised the Marketing Officer India for fruits, to discuss with the Fruit Specialist, Punjab, the whole scheme at Lyallpur. Finally a conference was held in February 1939, at Delhi in which Marketing staff of the Government of India, Horticulturists of various provinces and prominent fruit preservers took part.

In this conference final grade specifications were laid down for orange squash, lemon and lime squashes, lemon and lime juice cordials and orange marmalade. The proceedings of this conference with these specifications (covering 35 pages of printed matter) have since been published by the Government of India, which, it is understood, is already taking steps to introduce this National Mark system in the country.

It is sincerely hoped that every fruit preserver in this country will give his moral support and co-operate wholeheartedly with the Government in successful working of the scheme. Such an act will indeed be a great service to the cause of fruit preservation industry and give satisfaction to the consumers who will get genuine products, well worth the money they spend on purchasing them.

come to the forefront. This was, of course, bound to be the case, firstly because most of the existing old gardens bear fruit of rather low quality which is largely suited for by-products, and se-

condly, because the rapidly increasing area under gardens would make available a still larger amount of cull fruit (i.e. third class fruit which being blemished, oversized or undersized, over-ripe or under-ripe or being otherwise defective is unfit for sale in the fresh fruit market) or surplus fruit in certain seasons which must be utilized for certain by-products. The importance of this subject was amply explained in a talk broadcast by S. S. S. Lal Singh, Fruit Specialist, Punjab, from Lahore Radio Station, and which was reproduced in the Punjab Fruit Journal (Vol. II, No. 7, 1938) and need not be repeated here. Suffice to say, however, that in the absence of fruit preservation industry, fruit farming would at once cease to be remunerative and fail dismally even in those countries which are most highly advanced in horticulture.

2. To achieve our object, it is necessary not only to encourage commercial enterprise for preservation of fruits and vegetables and manufacture of by-products on a large scale, but also to popularize home canning and preservation of fruits for home consumption. For encouraging home canning, short courses in the subject should be given, while for commercial enterprise, there should exist a central institute in India which should be fully equipped in every way for advanced training.

3. Provision for short courses should and can be made by provincial governments, firstly because they should be frequently held during the year at various places in the Province, depending upon the availability of various kinds of fruits in the year; and this is quite a feasible and inexpensive method and does not require any great staff or

equipment. The main idea should be to popularize amongst the people, the recipes for manufacturing various fruit products like jams, marmalades, juices, squashes, tomato ketchup or home canning of fruits and vegetables by such simple methods and equipment that it may be readily taken up by the people and as far as possible ordinary home utensils should be utilized for the purpose. For instance in season of plenty, when oranges and lemons can be procured for about one pice each or when ordinary peaches, plums, apricots, etc., good for jam, can be had at one anna a seer or when tomatoes, due to glut in the market, can be had some times at rupee one or even less per maund, or when peas can be had at a couple of pice a seer; there is no reason why people should not make their own orange and lemon squash, orange marmalade, jam, tomato ketchup or can or bottle their own peas, green gram or whole tomatoes for use in season of scarcity when they can be had only at prohibitive prices. This is the only way that we can, not only remove glut from the market by extending the period of availability, but also raise the standard of living of middle class people without appreciably raising the cost of living. The above products which are now a monopoly of the rich people, ought to be relished also by middle class people especially when they can prepare these products at their own home at a ridiculously low cost which hardly amounts to one fourth the price charged in the bazar for these products.

4. Fruit Section of the Punjab Agricultural Department has amply proved the practicability of the above sugges-

tions, and many people, after getting a few days training or even merely following the recipes prescribed by the fruit section, have been able to prepare products like squash, marmalade, jam etc. which were declared by judges in the Provincial Fruit Shows to be as good as the imported products. Many Provincial Governments would like to popularize home preservation of fruits and vegetables, especially, if it can be done at a low cost. But there is hardly any place in India except Lyallpur where in addition to the training on "home-scale" production, modest facilities have now been provided for the purpose of training those wishing to take up this work on commercial scale.

5. **Central Institute.**—While provision for short courses can be made by Provincial Governments, there should be a central place financed by the I.C.A.R. which may have facilities for training such people who intend to take up this work on commercial scale and where teachers or demonstrators (required for short courses) could also get adequate training. For some time to come, one Central Institute for the whole of India can serve the purpose because, (a) the number of men intending to take up the work on commercial scale and the number of teachers or demonstrators required in each province cannot be very large, (b) each Provincial Government cannot afford to go to the extent of establishing its own institute with necessary staff, buildings and up-to-date machinery; (c) nor is it necessary or desirable for them to do so as it would prove to be an expensive venture without adequate recompense; and if at all attempted in the absence of necessary

facilities, there is likelihood of general inefficiency. It is also out of question for every province to send out men to foreign countries for training in the subject.

6. **Suitability of Lyallpur as centre for such training.**—While there may be some other places in India suitable for such a centre, Lyallpur appears to be an ideal place for such a training for several reasons, such as, the availability of many kinds of fruits, excellent facilities in the form of laboratories for teaching, research and commercial canning and juice making plant, necessary machinery, and staff with a considerable amount of experience at their back. Due to a variety of climate in the Punjab (from the coolest of the hilly regions to the hottest of the deserts), the province is able to grow most kinds of fruits—all kinds of citrus, mangoes, phalsa, jaman, pears, apples, peaches, plums, 'bers', dates, guavas, etc., so that students can receive adequate training in preservation of most fruits and vegetables. The adjoining provinces of N.W.F.P., U.P., C.P. and Kashmir State etc. are also good fruit centres. For intelligent preservation of fruits and vegetables, a certain amount of knowledge of Horticulture is absolutely indispensable, specially in regard to the suitability of various varieties of different fruits for canning, preparation of by-products or storage; different cultural treatments affecting the keeping and canning quality of fruits and many other such things. And no place in India could give better information than Lyallpur which has the biggest fruit section in India consisting of about half a dozen gazetted officers alone. There are also, at Lyallpur, already (a)

one laboratory for teaching, (b) one for research, where scheme of Fruit Preservation financed by I.C.A.R. is being carried out, (c) an underground chamber with exhaust fan, etc. for storing manufactured products in cool place, (d) Canning Hall for canning of fruits and vegetables, as well as a juice room for manufacturing juice and squash, both equipped with modern machinery for doing work on semi-commercial scale. Even a small Cold Storage plant of about two ton capacity has already been established and experimental work on storage of oranges, mangoes, pears, grapes, etc., carried out during the last

two years has given very encouraging results. As regards staff also, the Punjab is fortunate in having several members, highly qualified in the subject. With all these facilities already existing and some more that may be provided by the I.C.A.R., it can be a first class Central Institute where students would acquire not merely theoretical knowledge but actual practical experience in the Canning Hall on semi-commercial scale; and all this backed up by the research work both in fruit culture and fruit preservation and cold storage that would be constantly going on here.

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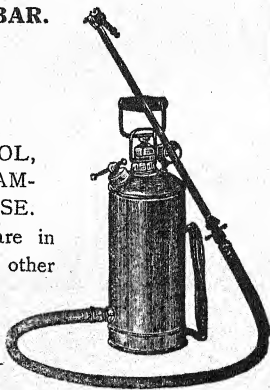
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Development of Cold Storage

by
S. S. Lal Singh, B.Sc. (Hons.),
M.Sc. (Calif.),
Fruit Specialist, Punjab
and

M. Abdul Hamid Khan, M.Sc.
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Cold storage is absolutely indispensable for the healthy development of fruit industry and it is no exaggeration to say that, but for the existence of cold storage facilities in other countries, their fruit industries would not survive for any length of time. Main reason for this is that a great majority of fruits are so easily perishable that, after removal from the trees, they cannot be stored even for a few days under ordinary atmospheric temperature. Cold storage plants help in extending the period of availability of fruits and thus reduce considerably the fluctuations in the prices of fruits. This enables the fruit growers to realize reasonable prices for their fruits and they do not have to dump their produce in the market at any price. They can release the fruit from the cold storage as and when required to meet the demand of the market. Consumers on the other hand are able to secure fruits at reasonable price for a longer period in the market.

Although fruit industry in this country has not, so far, made any great progress, still the profitable disposal of fruit has already become an acute problem for the growers. For instance, in the Punjab, Malta oranges in February can be had at almost one rupee a hundred and *sangtras* at even twelve annas a

hundred yet, after 2-3 months they cannot be had at even five times the price of this. This is the condition in case of citrus fruits, which have got a fairly good keeping quality, but worse is the situation in other fruits and vegetables which cannot be stored for even a day or two under ordinary temperature prevailing in summer. When there is glut in the market, which is quite frequent, fruits and vegetables can be had almost dirt cheap. Tomatoes in June can be had even at 8 annas a maund and the price easily goes up ten to twenty times after a few months.

Months of April to June are notorious in regard to the prevalence of many frightful diseases like typhoid when doctors in 99 per cent of the cases do not recommend to patients anything else but the use of fresh fruit juices which are not available at this time of the year except those stored in cold storages. In short, the cold storage plants can prove a boon to the growers and blessing to the consumers and it would be idle to expect sound development of fruit industry in the absence of cold storage enterprises.

The importance of this problem was realised long ago and the Fruit Specialist, Punjab, had submitted proposals several years back for the installation of a cold storage plants for experimental purpose

but financial stringency always stood in the way.

The Royal Commission on Agriculture also referred to the possibilities of cold storage, in a hot country like India, in the following lucid terms :

"Cold storage is in other countries, playing such a remarkable part in the marketing of goods, both for export and for internal consumption, with a result so generally profitable to the private enterprise, undertaking the arrangements, as well as to the farmer, that we do not doubt that sooner or later there will be a similar development in India."

Efforts were made during the years 1928—33 to secure foreign markets for the Indian Mango under refrigerated transport. And in March 1934 the Imperial Council of Agricultural Research inaugurated a comprehensive Research Scheme on the cold storage of Fruits and Vegetables at Kirkee (Bombay), at a cost of about Rs. 50,000/- which has so far extended its activities in various fields of fruit and vegetable storage.

Another scheme on the cold storage of fruits was set afoot at Lyallpur with conjoint efforts of the Imperial Council of Agricultural Research and the Punjab Government. The Cold storage plant was originally supplied free of cost by the Cold Storage Company of India for experimental purposes but later on was purchased by the Punjab Government.

It is the second year of the running of the Punjab scheme, during which period 4 main types of fruits, viz., 1. Citrus, 2. Mango, 3. Pear and 4. Grape have been tried. The results obtained so far are briefly reproduced here for

the benefit of the readers of the Punjab Fruit Journal.

I. CITRUS FRUITS

Storage experiments have been carried out on three major fruits, namely (1) Malta (*Citrus sinensis*), (2) Sangtra (*C. nobilis*), (3) Grape-fruit (*C. maxima* var: *uvacarpa*) at three temperatures, viz., 32°F, 36°F, and 40°F, with a variation of about 3°F. Fully matured fruits were employed in this investigation. Observations are briefly summarised below :

1. Optimum temperature of storage :—A temperature range of 36° to 39°F was found to be the best for all citrus fruits tried so far.

2. Storage life of various Citrus Fruits.—(a) Malta orange (*C. sinensis*): The storage life varied with varieties, (i) Valencia Late kept in good condition for 4½ months, (ii) Malta common, for 4 months, (iii) Seville for 3 months, (iv) Blood red for 3 months.

(b) Sangtra (*C. nobilis*):—Sangtra from two localities viz. Lyallpur and Pathankote kept in good condition for only 5 and 4 weeks respectively.

(c) Grape Fruit (*C. Maxima* var. *uvacarpa*).—Grape Fruit of two varieties viz. Triumph and Marsh Seedless was stored successfully for 5½ months and 3¼ months respectively. Marsh Seedless developed chill spots at the end of this period.

3. OTHER FACTORS AFFECTING THE STORAGE LIFE OF CITRUS FRUITS

(a) Size of the fruit.—Large fruits were found to keep in better condition

in the cold storage at 36°-39° F and also showed comparatively less decrease in the juice content during storage than the small fruits.

(b) **Wrapping treatments:**—Wrapping the fruit in butter paper as compared to control, proved beneficial. Wrapped fruits presented better appearance in regard to their colour and freshness and had higher juice content and lower wastage than unwrapped fruits.

II. MANGO

Langra variety of Mango was used in the trials.

Long before the commencement of the cold storage trials, on the Langra mango, acidity and refractometer tests were carried out at Lyallpur to determine the optimum period and the stage of maturity at which the fruit should be picked. It was found that the first to second week of July was the right time for picking the fruit for storage trials. Three stages of maturity were selected for storage, viz.,

1st. Lot:—Green mature, flesh white hard, acidic and crisp.

2nd Lot:—A stage more advanced than the first, flesh pale, less acidic—a stage 'before eating ripeness.'

3rd Lot:—Fully ripe, flesh yellow.

The fruits of lots (1) and (2) were stored at 36° F, 45° F, and 48° F. The ripe lot was stored at 32° F. The borax wash (in 5% solution) and wrapping was also tried in case of first two lots. 36 fruits each of lots (1) and (2), were smeared with a special paste sent by Dr. Schmidt and stored at the above three temperatures.

RESULTS

After a fortnight, fungal wastage and shrivelling were rather excessive in lots (1) and (2) at 48° F, whereas at 45° F the fruit of both these lots kept in excellent condition for 5 and 4 weeks respectively, after which the fruit began to show signs of shrivelling accompanied by rather intense fungal invasion, so that 45° F is considered most suitable. The fruit stored at 36° F also remained in good conditions for 5 weeks and was rather hard after which it began to show signs of shrivelling. The fruit of lots (1) and (2) stored at 45° F and 48° F ripened normally at 95°-100° F (after removal from the cold storage) but the fruit stored at 36° F did not ripen properly and became hard and brown skinned.

In regard to the third lot, i.e., fully ripe fruit, this showed a general browning of the skin after three days at 32° F.

In the above experiments, in general borax wash and wrapping had beneficial effect.

Effect of smearing the fruit with paste on storage life:—The paste sent by Dr. Schmidt, reported to have given good results in case of apples and pears, was not found to be efficacious in case of Langra mangoes. The fruit with paste on, at all the temperatures, developed a bitter taste and off flavour. Browning of the skin, to varying degree, was also observed at different temperatures. The browning was invariably accompanied by increased bitterness in taste and obnoxious flavour.

III. PEAR

Bartlett pear from Kulu was stored during the first and second weeks of

August 1938. The fruit of three stages of maturity was selected for storage, namely :—

A. Stage of maturity :—The fruit was yellowish green, firm, crisp, astringent and acid.

B. Stage of maturity :—Greenish yellow, still crisp, less astringent and acid.

C. Stage of maturity :—Fully ripe, yellow, sweet and creamy.

The fruit of A. and B. stages of maturity was stored at 32° F, 36° F, and 40° F and that of C. stage of maturity stored at 32° F. The fruit in the above experiment was subjected to borax wash (5% strength) and wrapping treatments.

RESULTS

The fruit stored at 40° F ripened normally within 20 days in case of B and 25 days in case of A stage of maturity and remained in storage in excellent ripe condition for a week after. The fruit (A. and B. stages of maturity) stored at 36° F behaved in a manner similar to that at 40° F except that the ripening was slow. It took 6 and 4 weeks respectively for the fruit of A. and B. maturities to become yellow ripe at this temperature. The fruit (A and B stages of maturity) stored at 32° F kept in excellent condition for 5½ months and 4½ months respectively. Fruit of C. maturity

stored at 32° F suffered from 'water-logging' effect.

Borax dip had an adverse effect on the keeping quality of fruit except at 36° F in case of treated wrapped fruit.

Wrapping reduced the loss in weight but increased wastage of fruit as compared to unwrapping.

The experiment is being repeated in order to confirm the results of previous years.

IV. GRAPE

Kishmish Grape :—The kishmish (white seedless Quetta grape) was purchased from the local market. The fruit was subjected to borax wash (5% strength) and packed in dry grass. The fruit under each of the above treatments was stored at 32° F, 36° F, and 40° F.

RESULTS

1. 32° F was found to be the best temperature for the storage of grape.

2. The commercial storage life was found to be 20 days at 32° F. but 25% of the original weight could be kept in excellent condition for about six weeks by carefully removing the brown and diseased berries.

3. Borax treatment was found to be injurious as it increased wastage. Packed fruit at 32° F. kept better than unpacked fruit but reverse was the case at 36° and 40° F. The loss in weight was highest at 40° F and least at 32° F.

The experiments on Kishmish and Haitha grapes are being conducted again during 1939. Besides the usual borax and 'dry grass pack' the fruits of both the above varieties have been packed in cotton wool and sawdust and stored at 32° F. It is too early to draw any definite conclusions but indications are that sawdust and cotton wool pack are behaving well even after 1½ months.

It will not be out of place to mention that the industry though still in its

infancy has not escaped the eye of the discriminating businessman. Cold storage houses have sprung up at various places of the Province, of which Mr. R. K. Rai's at Sialkot and Mr. G. E. Wakefield's at Rawalpindi, require special mention. Mr. Rai stored potatoes and has been encouraged to embark on the storage of oranges. Mr. Wakefield's storage is at a central place, where in addition to the Punjab fruits, he can also tackle the Kashmir and Peshawar fruit.

RENEWAL OF MEMBERSHIP

"Ordinary" and "Regular" members of the Punjab Provincial Co-operative Fruit Development Board are requested that as their term for membership for 1939 has expired on 31st Dec., 1939 they should remit their renewal fees by Money Order. "Regular" members are required to remit Rupees six each while "Ordinary" members an amount of Rupees three only.

"Life" members who have not completed the instalments of their life membership are also requested to do so now.

Important Insect Pests of Fruit Trees in the Punjab and their Control

by

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The Entomological Section, Lyallpur has done a great deal of work on the important insect pests of fruit trees in the Punjab. Their life-histories have been worked out and measures to control them have been devised. Much of this information has been published in Departmental leaflets, Seasonal notes, etc. In this article it is proposed to present the information available on these pests in as brief a manner as possible. References to published records on them are given in the parenthesis.

A. Insects Damaging Citrus

1. Eating leaves.—(a) Young soft leaves being eaten from the edge right upto the mid rib. Caterpillar when young looks like birds droppings and is a curious blend of black and white but when older it becomes green with a number of brownish stripes on the side of its body. When disturbed it throws out two light orange coloured horn-like processes from behind its head. When full grown it measures more than 2 inches in length—Lemon Butterfly caterpillar (*Papilio demoleus* Linn.).

Control.—(1) Hand pick the caterpillars and drop them in kerosenized water. (2) Dust plants with Sodium

fluosilicate mixed in ashes or fine road dust (1 : 8). (3) Spray with Lead arsenate (3 chhataks) mixed with lime (6 chhataks) dissolved in water (4 gallons). (4) Catch butterflies in hand-nets and kill them.

[Reference.—(1) Punjab Agricultural College Magazine, Vol. 2, No. 5, page 226, 1935.]

[(2) Memoirs of the Department of Agriculture in India (Entomological Series) Vol. V, No. 1, page 33, 1914.]

(b) Feeding concealed in leaf tissue and making silvery white zig-zag galleries on the leaf, moth very small and dirty white—Citrus leaf minor. (*Phyllocnistis citrella* Stn.).

Control.—(1) Prune citrus plants in December and January and remove regularly the attacked leaves from young nursery plants and burn them. (2) Avoid citrus hedges round citrus plantations.

[Reference.—(Punjab Agricultural College Magazine, Vol. 2, No. 5, p. 226, 1935.)]

Note.—Both the above-named insects are destructive to young citrus plants in the nurseries.

II. Sucking sap from leaves.—(a) Terminal tender branches and leaves with numerous orange coloured, small nymphs, which are the young ones of citrus psylla, (*Diaphorina citri* Kuw). The attack by this insect is at its worst during March-April. The leaves of the attacked plants, because of the honey dew, presents a shining appearance at first but later on, because of the growth of a black mould, they appear black.

Control.—Spray with rosin compound in winter and tobacco decoction during spring.

[References.—(1) Punjab Agricultural College Magazine, Vol. II, No. 5, page 227, 1935.

(2) Departmental leaflet No. 9.

(3) Memoirs of the Department of Agriculture, in India (Entomological Series). Vol. X, No. 2, 1927.]

(b) Lower leaves black. Under side of older leaves mottled with pale yellow 'spots', which are young ones of citrus white-fly (*Dialeurodes citri* Ash.).

Control.—Spray under side of leaves with Rosin compound.

B. Insects Damaging Mangoes

I. Damaging Mango seedlings.—

Mango seedlings drying up due to the attack of white ants (*Microtermes* sp. and *Odontotermes* sp.) under ground.

Control.—Keep off the pest by mixing $\frac{1}{2}$ lb. of crude oil emulsion plus a little of arsenic with four baskets full of sub-soil used for filling the pits. (2) Paint trees upto 7 inches from the surface with sanitary fluid using 6 oz. of sanitary fluid per tree. (3) To protect roots pour in

the irrigation ring a solution prepared by dissolving 3 parts of Sanitary fluid in 100 parts of water.

II. Sucking sap from tender branches of older trees.—Terminal portion of the tender branches covered with flat bodied wax covered females and nymphs—Mango mealy bug (*Monophlebus stebbingi* Gr.).

Control.—(1) Destroy eggs between July and December by scrapping soil upto a depth of 4-6 inches from underneath the infested trees. (2) Spray heavily infested parts of the plant with fish oil soap (12 chhataks) dissolved in (4 gallons) of water. (3) Band the trees from December to April with (a) fluffy cotton bands (b) San hemp or Munj rope soaked in coal tar and crude oil emulsion in equal parts. The bands are put up 3 or 4 feet high from the ground. The females and nymphs collected on either side of the bands can be killed by spraying with fish oil soap (1 seer) dissolved in water (40 seers).

[Reference.—Punjab Fruit Journal, Vol. III, No. 11, page 514, 1939.]

III. Damaging mango inflorescence.

—Leaves black. Inflorescence withering and flowers falling off. Myriads of greenish yellow small insects on such inflorescences are the young ones of Mango.hoppers (*Idiocerus* spp.).

Control.—Spray with Rosin compound during December-January to kill the adults.

[References.—(1) Departmental leaflet No. 32.

(2) Punjab Fruit Journal, Vol. III, No. 11, page 514, 1939.]

C. Insects Attacking Pomegranate and Guava

Fruits of pomegranate and guava with holes. Inside a blackish brown caterpillar with flesh coloured marks on its body, 'Anar' Caterpillar (*Virachola isocrates* Fabr.)

Control.—(1) Destroy attacked fruits. (2) Catch butterflies in hand-nets and kill them.

D. Insects Damaging Grape Vines

I. Eating leaf.—Leaves with egg clusters covered with yellowish hairs. Leaves present a parched appearance. On the underside of leaves a number of dark reddish brown hairy caterpillars, *Ber* Hairy caterpillars (*Euproctis* sp.). (This insect also feeds upon and damages the leaves of *Ber* and *Falsa*, castor, etc.).

Control.—(1) Collect egg clusters. (2) Dust plants with Sodium fluosilicate and ashes (1 : 8). (3) Spray lead arsenate-lime mixture (see under Lemon Butterfly caterpillar above).

II. Sucking Sap from leaves.—Leaves brown with a number of white patches, on the underside tiny brownish-yellow and yellowish-white, winged and wingless insects abound.—Grape Vine Thrips (*Rhipiporothrips cruentatus* Hood.).

Control.—Spray attacked plants with tobacco decoction.

[Reference.—Indian Journal of Agricultural Science, Vol. VII, No. 4, 1937].

E. Insects Damaging Peach

I. Sucking sap from the leaves.—Leaves badly curled and crowded together; inside such leaves small delicate

brownish insects—Peach curl *Aphis* (*Brachycaudus pruni*).

Control.—Spray plants with tobacco decoction.

[Reference.—(1) Punjab Agricultural College Magazine, Vol. II, No. 5, page 228, 1935.

(2) Memoirs of the Indian Museum, Vol. VI, page 222, 1915.]

II. Boring in Peach fruits.—Fruits deformed often with a hole. Inside are the legless and creamy white coloured young ones of the Peach fruit fly (*Chaetodacus zonatus* F.).

Control.—(1) Destroy damaged fruits. (2) Stir up soil frequently underneath the attacked plants. (3) By spraying poison baits on some portions of the attacked plants. The bait is prepared by mixing lead arsenate (1 chhatk) with molasses (3 chhatk) dissolved in 4 gallons of water.

[References.—(1) Leaflet No. 102.

(2) Punjab Fruit Journal, Vol. III, No. 11, page 514, 1939.]

F. Insects Damaging Apples

(In Kulu Valley and Simla Hills).

I. Sucking sap.—(a) Branches with bluish-white cottony patches or whitish wreaths hanging down. Concealed within this cottony material are purplish brown insects—Woolly Aphis (*Eriosoma lanigerum* Hausm.).

Control.—(1) Purchase only Woolly Aphis free nursery stock. (2) Use its parasite—*Aphelinus mali*. [Ask the Entomologist to Government Punjab, Lyallpur, for it.]

(b) Branches appear to be dusted with greyish powder due to a covering of greyish scales, each being the size of a pin-head with a central nipple, each scale encloses a female or young one of the San Jose Scale (*Aspidiotus perniciosus* Comst.).

Control.—Spray plants between November to February with Deizel oil emulsion.

[Reference.—Departmental leaflet No. 88.]

G. Insects Damaging Walnuts

(In Kulu Valley and Simla Hills).

I. Attacking fruit.—Attacked fruits with a hole, the ground underneath the attacked plants covered with fallen fruits in May and June. Inside the fruit is a white grub—Walnut borer (*Alcidodes porectirostris* Mshl.)

Control.—Collect and destroy attacked fruits in May and June.

H. Insects Damaging Figs

1. Boring in the Stem.—Stem and main limbs nearer ground show large holes with frass and chewed wood coming out and also heaped up on the ground. Inside the stem is a large white grub-fig borer (*Batocera rufomaculata*).

Control.—(1) Uproot and destroy dried plants. (2) Inject a little kerosene oil in the holes and plug them up with mud.

Note.—This insect also attacks mangoes.

[Reference.—Punjab Fruit Journal, Vol. III No. 11 page 515, 1939].

I. Insects Damaging Date-palms

(a) **Feeding on leaf bases.**—Boring below the crown, growing point killed or leaves opening out from attacked crowns present a jagged and ragged appearance. A large black beetle—Date-palm beetle (*Oryctes rhinoceros* Fb.).

Control.—(1) Hook out beetles from the attacked stems. (2) The insect feeds in the immature stages in manure heaps, so do not allow manure to accumulate for more than a month.

(b) **Boring in the stem.**—Stem with holes from which dirty resinous juice trickles down. Inside the stem a fat red headed creamy white grub—Red palm weevil grub (*Rhynchophorus ferrugineus* Fb.).

Control.—(1) Paint wounds and cuts with coal tar to stop egg laying. (2) In the case of young plants make mud basins round the plants and drown the pest inside the stem by keeping it full of water. (3) Inject a little kerosene oil in the holes and plug them up with mud.

[Reference.—(1) Memoirs of the Department of Agriculture in India (Entomological Series), Vol. II, No. 10, page 205, 1912.]

Some Important Diseases of Apples in the Punjab & Their Control.

by

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The most common diseases of apples in the Punjab are, Scab, Powdery Mildew and Brown Rot. These are briefly described in this article.

1. SCAB

Scab affects apples as well as crab apples.

Symptoms.—Conspicuous, rounded, black blotches, spots or scabs occur commonly on the fruit. The disease also occurs on leaves and young wood.

The scabbed fruits are unsightly and at the same time keep badly, for moulds often find their way into the fruit following scab injury to the skin and such fruits, especially when ripe, readily decay.

The affected leaves in severe cases dry and may even fall prematurely and loss of vigour in the tree results and the total yield of the crop is reduced. Scab injures the young wood of some varieties and thereby provides a means of entry for other fungi.

Cause of the disease.—Apple scab is caused by the fungus *Venturia inaequalis*.

Methods of over-wintering.—The disease over-winters out of doors on

fruit still attached to or fallen from the trees, on fallen dead leaves and on the young wood.

Control measures.—Though the total suppression of the above described potential sources of infection (fallen leaves and fruits etc.) is a practical impossibility, yet every effort should be made that all practical means should be adopted to reduce them to a minimum. If this be done, and if primary infection and subsequent spread be further prevented as far as possible by spraying, almost clean crops of enhanced value will be the result.

Bordeaux mixture and lime sulphur solution are recommended for spraying. Lime sulphur is safer for sensitive varieties.

The first application should be made just before flowering, (when the buds are just showing pink), and second as soon as petals have fallen. A third made about three weeks later, is often advantageous.

For the first application use 4:4:50 Bordeaux mixture and for the second and third applications it is safer to use lime sulphur solution (1-99).

2. MILDEW.

Symptoms.—Affected leaves show the curled and white appearance characteristic of most mildews. The mealy substance (these are the spores of the causal fungus) is at times very abundant and hence with favourable weather, the disease may spread rapidly. The flowers are also attacked. In some cases the flowers are so injured that the whole tree fails to set.

Cause of the disease.—The cause of the disease is the fungus *Podosphaera leucotricha*.

Methods of over-wintering.—1. The fungus over-winters by means of resting spores (produced in perithecia on the wood at the base of current year's growth).

2. Mycelium of the mildew enters the young bud and remains dormant there till next year.

Measures of control.—(1) During pruning operations in winter all shoots which were mildewed during the previous year should be cut away. In spring and summer the trees should again be gone over and all infected shoots whether leaf buds or flower trusses should be carefully cut off and burnt.

(2) Spray with lime sulphur solution (1-99) shortly after the blossoms set and again later if necessary.

3. BROWN ROT

Symptoms.—The soft brown patches begin as mere spots and gradually increase in size until the whole apple is affected. At the same time, all pustular swellings appear beneath the

skin and soon burst through as yellowish or buff coloured, cushion-like outgrowths, usually arranged in concentric circles. The diseased apples ultimately shrink in size and the skin becomes wrinkled. Such fruits, when hanging loosely, are easily detached and many fall to the ground during a high wind; the fungus continues to develop on these windfalls, and more pustules are produced, which act as sources of further infection as the spores are easily blown about by wind. The brown rot fungus attacks apples in storage also.

Cause of the Disease.—The disease is caused by the fungus *Sclerotinia fructigena*.

Methods of Over-wintering.—(1) The fungus over-winters in mummied apples.

(2) The fungus may hibernate in the fruiting spur or even as far as the branch itself, producing in the latter a canker round the base of the spur.

Control of the Disease.—(1) All the mummies should be removed in winter and buried in the ground.

(2) In summer all the affected fruits whether on the trees or lying about in the garden should be removed and buried in the ground.

(3) All the infected spurs, together with cankers on the stem, should be cut out. The operation is best performed in summer.

(4) Brown rot is liable to set in wherever there is a wound. The greatest care therefore should be taken not to injure or bruise the fruit, especially during nicking and packing. Apples should

be picked with their stalks still attached, to avoid wound in the flesh.

(5) When storing, all fruits showing signs of brown rot should be discarded to prevent the spread of the disease to healthy apples.

Control Measures When Scab, Powdery Mildew and Brown Rot all Occur Together

If Scab, powdery mildew and brown rot all occur in a garden the following measures should be adopted to control them :—

1. **Removal of mummies and other diseased fruits.**—No mummies or other diseased fruit should be left, either lying about on the ground or still hanging on the trees. Such fruits or mummies should be either burnt or buried deeply.

2. **Destruction of fallen leaves.**—The fallen leaves should be collected in the autumn and should be burnt or buried. Cultivation of the soil in such a way as to bury the leaves before they have become dispersed would remove the danger of spring infection from this source.

3. **Pruning during winter.**—(i) During pruning operations, when the wood is badly attacked by scab, as much as possible should be cut out without injuring the trees and the cuttings should be buried.

(ii) All shoots which were mildewed during the previous summer (recognisable in winter by the white appearance of the young wood) should be cut away and burnt.

4. **Cutting out in spring & Summer.**—When the buds expand in the spring, the trees should again be gone over and

all the mildewed shoots whether flower trusses or leaf buds should be cut and burnt. The removal of infected shoots should be carried well into the summer.

All diseased spurs together with cankers on the stem, should also be cut out. This operation is best performed in summer when the dying spurs are conspicuous, but it might be carried out in winter.

5. **Picking.**—Apples should be picked when their stalks still attached.

6. **Precautions as to storage.**—When storing, all fruits showing signs of rot should be discarded.

7. **Spraying.**—First application should be made just before the blossoms open. The buds are showing pink at this stage. The period for effective spraying at this time is about three days. For this application use 4:4:50 Bordeaux mixture or lime sulphur solution (1 to 29).

Second application should be given just after the petals have fallen, beginning when they are two-thirds off. The period for effective spraying is 3—5 days.

[Repeat the first Bordeaux mixture spray i.e. 4:4:50 Bordeaux mixture, but for sensitive varieties lime sulphur solution (1 to 99) should be used].

Third application should be made about three weeks after the second application (repeat the corresponding second application).

Fourth application should be made in July or August.

(Repeat the corresponding second application).

Withertip of Citrus Plants

by

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SYMPTOMS

The withertip disease due to the fungus *Colletotrichum gloeosporioides* Penzig, is probably the most destructive fungus disease known to attack the citrus plants. It is also known by the names of Bloom Blight, Leaf Spot, Lemon Spot, Anthracnose, etc., according to the injuries it causes. This disease is very common in India and has been found to be present on all species of citrus. It is uncertain where this disease originated at first but it is now found all over the world wherever citrus is grown. Besides affecting branches, twigs, leaves and large fruits, it is responsible for dropping of fruits prematurely and also shedding of flowers before and after opening. It also attacks the budded plants in nurseries.

The fungus is not an active virulent parasite, but when trees are weakened or injured by other causes, such as, over cropping, starvation, dry weather, frost, attacks of insects, viz., white fly (*Tela*) and other diseases, it attacks the plants virulently. When firmly established it progresses rapidly and does much damage to different parts of the tree, interfering with its fruitfulness and often destroying much of such fruit as is produced. If trees are kept in healthy vigorous condition at all times, it is difficult for the disease to get a start.

On the twigs :—The disease affects twigs, branches or tips of twigs. When attacked, they soon wither and die and assume silver grey appearance. Black minute dots, i.e., fruiting bodies of the causal fungus appear on them. The leaves wither or turn yellow and drop. The disease progresses, making its way from the outer smaller twigs and branches to larger ones nearer the centre and eventually large portions of the tree top are either killed outright or so weakened and injured as to be useless.

A withertip diseased tree is marked by a number of dead twigs, branches, yellowed leaves and stunted growth.

On the Leaves :—Often healthy leaves suffer mechanical injuries, or spots may develop on them as a result of sunburn or frost. Insect attacks may also leave weakened spots in the leaf tissue. In these weakened or injured areas the withertip fungus grows and invades the surrounding tissue. The spots formed are somewhat circular, yellowish grey in colour. These are known as leaf spot or anthracnose. As the disease develops minute dark specks are noted over these areas. These are the fruiting bodies of the causal fungus.

Bloom Blight :—Flower buds and flowers are attacked. Careful examination of the flowers and buds shows the presence of numerous small red specks in marked contrast to the normal white colour.

Premature Fruit Fall and Stem-end-rot of Fruits :—On infected trees the falling of the Flowers may be followed by dropping of the immature fruit. This fall is generally noticed in May and June. The attacked fruits change their colour from green to pale yellow, brown or even dark brown in most severely affected cases.

In the cases of such affected fruits, as escape falling rot sets in.

On Budded Plants :—This fungus has been found to attack freshly budded plants at various places. In some cases it has been found to cause considerable loss.

Control Measures :—The prevalence of the disease in an epidemic form is due to ignorance and neglect than to any thing else. In many of the old gardens dying or dead plants are left in the field which act as a perpetual source of infection. Under humid conditions the fungus flourishes unchecked and pinkish masses of spores ooze out from the fruiting bodies and thus cause further infection to tender twigs, branches and leaves.

It has been observed that old and weak trees are more liable to the attack of the fungus than the young trees. The

following recommendations are made for the control of the disease :

1. Twenty seers of farm yard manure and half seer of ammonium sulphate as manure should be applied in February.

2. Diseased twigs should be cut down including about three inches of the green portion after the fruit is picked. The branches should be collected and burnt. The cut ends of big branches should be coal-tarred.

3. The plants should be sprayed with ferrous sulphate—Bordeux mixture (4 : 4 : 50) in February, April and September.

Formula

Copper sulphate	..	4 lbs.
Ferrous sulphate	..	4 lbs.
Lime	..	8 lbs.
Water	..	50 galls.

Dissolve copper sulphate and ferrous sulphate either together or separately in about 10 gallons of water, slake the lime and add water to make 40 gallons of the lime solution. Then pour the lime solution through a strainer, then add solution containing copper sulphate and ferrous sulphate to the lime solution stirring the mixture all the time while pouring. This mixture should be used within 24 hours as it deteriorates if left over longer.

Dietetic Values and Therapeutic Qualities of Fruits & Fruit Juices

by

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(Kansas),

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Punjab Agricultural College, Lyallpur.

Until recently fruits have been used mostly by the well-to-do people and their cultivation and consumption has been restricted to the high class society alone; hence they have been considered as luxuries, only within the reach of rich people. This is true even to-day to a considerable extent especially in the case of fruits of good quality. But the average educated Indian is becoming conscious of the dietetic value of fruits.

In the last few decades science has made wonderful progress in widening our knowledge regarding the dietetic value of various foods, especially of fruits. It has been established by scientific researches that human diet besides being rich in proteins, carbohydrates, minerals and fats, must also contain adequate supplies of various vitamins. These are of relatively simple chemical composition and their presence in the diet helps the continuity and maintenance of the normal functions and development of human body and its various organs. Continued absence from diet of any of the vitamins results in due course, in definite diseased conditions which are characteristic of the absence of each particular vitamin. It would be useful to acquaint the readers with the functions of various vitamins. They are given below:—

Vitamin A.—It is known as the "Anti-xerophthalmic" or "anti-infective" vitamin. Its continued absence from diet results in cessation of growth in the young, night blindness, drying up of the tear glands in eyes and development of an eye disease called Xerophthalmia. Its absence also increases the susceptibility of a person to get infected with disease, i.e. reduction in resistance to such infection.

Vitamin B.—"Anti-Beri-beri" or "anti-neuritic" vitamin. Its absence from diet also results in cessation of growth, inflammation of the polyneuritis nerves in fowls and neuritis of the feet and legs in persons, causes lack of appetite. Continued use of polished rice and white-bread will result in this trouble.

Vitamin C.—It is known as "anti-scorbutic" vitamin. Its absence in diet causes bleeding of gums and loosening of teeth, diminishes the utilization of bone forming salts and causing a disease called scurvy characterised by the cutaneous hemorrhage or appearance of black spots on the skin.

Vitamin D.—It is known as "anti-richitic" vitamin. Its continued absence causes rickets (softening and poor development of the bones, resulting in deformity), by upsetting the balance of

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Vitamin D.—It is known as "anti-richitic" vitamin. Its continued absence causes rickets (softening and poor development of the bones, resulting in deformity), by upsetting the balance of

calcium and phosphatic salts in blood. Its presence promotes good formation of bones and teeth. It is formed in the skin when it is exposed to sunlight.

Vitamin E.—It is known as the "anti-sterility" vitamin. Its absence in diet causes sterility.

Research workers working on food deficiencies are all unanimous in pro-

claiming that fruits are one of the richest source of vitamins as can be seen from the following table representing the tests carried on Indian Foods mostly for vitamins A, B, C, (Health Bulletin No. 23, 1937, Conoor, S. India) and for remainder, tests on European and American foods (Dr. E. Brownings' Vitamins, 1931):—

VITAMIN CONTENTS OF FOODS

		+++ Exceptionally rich		++ Very rich		+ Rich		Blank represents no tests.		+ Fairly rich		± Somewhat present		— Absent	
Food Stuff.															
Vitamin.															
FRUITS:—		A		B1		B2		C		D		E			
Almond	...	++		++				±							
Apples	...	++		+											
Apricots	...	++													
Bananas	...	++				++		±		±		+			
Cherries	...	++		++											
Dates	...	++				+		±							
Grapes	...	++		+				±							
Grape fruit & Juice	...	+		+				++							
Guavas	...	+						++							
Lemons & Juice	...	+		++				++							
Limes & Juice	...	+		+				++							
Mango	...	+++		+		±		++							
Orange & Juice	...	++		+				++		—		± to +			
Papaya	...	+++		+				++							
Peaches	...	+						±							
Pears	...	+		+				±							
Plums	...	+		+				±							
Persimmons	...			+				±							
Pineapple	...	++		++				±							
Pomegranates	...							±							
Strawberries	...	±		+				++							
VEGETABLES:—															
Cabbage	...	++++		++		+		+++		+		+			
Carrots	...	++++		++		+		±		±					
Cauliflower	...	+		+				±							
Peas	...	+		+				++							
Potatoes	...	± to +		+		++		++							
Spinach	...	+++		++		++		++		± to —					
Tomato	...	++		++				+++							
GRAINS:—															
Wheat	...	+		+++		±		—				+			
White Flour ("Maida")	...			± to —				—							
Rice	...	+		+		±		—							
Rice (Polished)	...	—		—		±		—							
Barley	...	±		++		±		++		+		± to —			
Corn	...	±		±		±		±		±					
Sugar	...	—		—				—							
MEAT, etc:—															
Eggs (Fowl)	...	+++		+		++		±		++		++			
Fish	...	±		±		++									
Cod liver oil	...	+++		—				—		+++		±			
Mutton	...	±		++											
Milk (cow)	...	+++		± to ++		++		+		± to +		± to +			
Yeast	...	± to —		+++		++				—					

From the above table it is evident that highly milled cereals (such as "maida" or white flour) polished rice, starches, sugar etc. are lacking in vitamins while the fruits and vegetables are a rich source of them.

Fruits are also rich in mineral elements such as calcium, phosphorous, potassium, magnesium, sulphur and iron which are also important and essential for the proper growth and functioning of the human body.

Laxative and Other Beneficial Qualities of Fruits.—The laxative qualities of fruits are due to two reasons. One is that the fruits contain 80 to 90% of water and thus are not only easily digested but also serve to flush the digestive system. The other reason is that they furnish to the digestive tract, a sufficient roughage or bulky materials, like cellulose, to stimulate it mechanically by means of a mild friction.

Fruit acids serve as mild antiseptics and produce in the blood stream of the body a final alkaline reaction. The greater the amount of acid producing foods, or those rich in protein, such as eggs, meat, fish, etc., are consumed, the stronger the reason for consumption of a larger amount of fruits in order to neutralize this acid reaction in the blood.

Therapeutic Values.—Health giving qualities of fruits and fruit juices have long been recognized by our indigenous medical men and it is due to the education imparted to the public by our "Vaid" and "Hakim" that certain syrups prepared from juice of fruits, like the phalsa, are considered to be "Thanda" or cooling in their effect.

Pomegranate and Sweet Lime or 'Mitha' fruit juices are also considered to have a similar effect. "Mitha" is generally prescribed not only by Vaid or Hakim but also by the allopathic medical practitioners for patients suffering from malaria.

It has been definitely established in the West that fruit juices can serve as a substitute drink in place of milk to those children whom milk diet does not suit, or milk can be made palatable for such children by reinforcing the same with a fruit juice.

Fruit juice drinks serve as a source of readily available energy not only to the sick or invalids but even to sportsmen. This quality is due to the presence in fruit juice of the two sugars (Glucose and Fructose) that are taken up by the body directly into the blood stream. Cane sugar on the other hand has to undergo a preliminary digestive decomposition before it can be utilized by the body.

The medicinal and curative qualities of fruits are due chiefly to the following three properties of fruit juices :—

1. **Their Paucity in Albumen.**—A diet rich in albumen causes excessive formation of the uric acid. Due to accumulation of decomposition products of such a diet the kidneys are not able to eliminate them satisfactorily. Increased consumption of fruits in diet enables the kidneys to function normally.

2. **Low Salt Content.**—Because fruits and fruit juices contain low amounts of salt, they can be freely prescribed in a diet aiming at one with a low salt con-

tent. Such diet is also prescribed in kidney troubles in order to give them rest.

Trouble of gout is now being treated by the use of fruit juices as they help in elimination of urea. Their wide use is also being made for curing liver and gall bladder troubles.

3. Low Fat Content.—This property of fruits and fruit juices not only helps in curing the kidney troubles such as gout and gall bladder but also has been the cause of fruits being widely used as a "Slimming Diet." It is not uncommon to read in health journals and magazines various famous film "stars" having their diet, consisting chiefly of various fruits consumed by them in different ways and quantities in order to keep not only in general good health but also to keep the excellent form of their bodies, which is largely possible with consumption of a diet, lacking in fats, such as fruits.

Fruit juices are extensively being used to advantage by doctors in Europe in prescribing them to patients suffering from respiratory and tuberculine lung troubles. Chronic Asthma has also yielded to such treatment. Those suffering from diabetes are deriving an immense curative relief from the use of such diet of fruits or fruit juices on certain days in a week.

Duodenal and gastric troubles have been successfully controlled by the use of certain fruit juices.

Blood pressure, the malady of the modern civilization, has been reduced and finally cured by the free use of fruits and fruit juices.

The common household phrases in the educated families such as "Fruits are Nature's own Tooth Brush" or "An apple a day keeps the doctor away" are, therefore, not without sound foundation.



The Story of Development of the Punjab Provincial Co-operative Fruit Development Board

by

K. L. Kohli, M.A., L.S.G.D.,
Assistant Secretary, Pb. P. C. Fruit
Development Board, Ltd.

The chronicle of the rapid development of the Punjab Fruit Development Board is an instance of the keenness and progressive outlook of the fruit growing community of the Province. Despite the many financial and constitutional handicaps and scanty support from the government since its inception, its record of expansion belies the popular belief that the committee basis of organisation is unsuited to "the Land of Five Rivers."

On the occasion of the Punjab Citrus Show, Lahore, held in January, 1934 the Punjab fruit growers were advised by the department of Agriculture to have a central organisation of their own. This, however, did not materialise till 12th May 1935, when this central organisation was registered as the Punjab Provincial Co-operative Fruit Development Board under Section 9 and Act II of 1912, with His Excellency, the Governor of the Punjab as Patron and the Hon'ble Minister, Incharge of Agriculture as Vice-patron. In addition to the above, the Board has been fortunate in having the following five high

officials as Ex-officio members on its Managing Committee :—

- (1) The Financial Commissioner, (Development), Punjab.
- (2) The Director of Agriculture, Punjab.
- (3) The Commissioner of Rural Reconstruction, Punjab.
- (4) The Chief Engineer, Irrigation Department, Punjab, and
- (5) The Fruit Specialist, Punjab, Lyallpur.

With his characteristic instinct for realities, the Punjab Fruit Grower has become an ardent supporter of the Provincial Fruit Co-operative movement and it can be safely predicted that the day is not distant when the Punjab Fruit Development Board will be reckoned as a force in the rural economy of the Province. There are at present over 400 members of the Board, representing 25 districts out of 29 districts of the Punjab, irrespective of caste, creed and colour.

Local Fruit Growers' Associations.—

In addition to the Fruit Growers Associations of Nurpur, Pathankot, Sheikhpura, Muzaaffargarh, Montgomery, Lyallpur, Amritsar, Ludhiana, Ferozepore, Karnal and Pind Dadankhan established before the working of the Board in 1936, new Fruit Growers' Associations have been formed at Ambala, Hoshiarpur, Garhshankar, Gujrat, Jhang, Kulu, Murree, and Kotgarh. Associations of Karnal, Hoshiarpur, Sheikhpura and Lyallpur have been successfully holding District Fruit Shows. Some of the associations, however, are not very active.

The Managing Committee

With a galaxy of public men and officials, who compose the Executive of the Board, the Fruit Co-operative movement in the Punjab has an assured future. The Board is fortunate in having a strong representative Managing Committee of 30 members (including five Ex-officio members) representing all shades of opinion with the Hon'ble Ch. Sir Shahab-ud-Din, Speaker of the Punjab Legislative Assembly, as President and the Hon'ble Mr. Justice Bakhshi Tek Chand, Judge High Court, Lahore, as vice-President. Besides this the Managing Committee includes a number of other distinguished public men like L. Mehar Chand Mahajan, President, High Court Bar, Lahore; S. B. Ujjal Singh, M. L. A., Nawab Ahmad Yar Khan Daultana, M. L. A., S. B. Hari Singh Rtd. Deputy Commissioner, Criminal Tribes, Lahore; Mr. J. G. Bhandari, Rtd. Acctt. General, Punjab, Capt. L. Mitchell of Indian Mildura Fruit Farms, Ltd., Montgomery, L. Duni Chand, Bar-at-Law, Lahore, etc. The Board is very fortunate in having an officer of exceptional ability and enthusi-

asm in the person of S. S. Lal Singh, the Government Fruit Specialist, as its Honorary Secretary who is virtually responsible for most of the success of this organisation. It is to the credit of the members concerned that they have been attending the meetings at their own expense and have been taking keen interest at great personal inconvenience. The development of various beneficent activities of the Board is briefly reviewed as under :—

Publication Activities.—Considering the extreme paucity of popular horticultural literature in India, the Board started a bi-lingual organ, the Punjab Fruit Journal, in January 1937, with the Government Fruit Specialist, who is the Honorary Secretary of the Board, as its Chief Editor. Twelve issues of the journal, excluding this 1940 Annual Number have so far been published. There is a growing demand for the special numbers of the journal from all over the country. The Mango Number of the journal which was published in July 1939, proved exceedingly successful both from financial and educative points of view and we are sure that this present cyclopaedic compilation of 1940 Annual Number would prove another souvenir worthy of the occasion. The number of pages so far covered in the English Section are 600 and in Urdu Section 404 including every important aspect of horticulture and its allied problems.

The periodical has grown into an all-India institution with fruit fans all over India, Burma and Ceylon. It is seldom that technical journals are self-supporting but it is gratifying to note that not only has this venture been self-supporting but during its three years of exist-

ence the Journal Account has shown a surplus of Rs. 2,073|15|9 up to the 31st July, 1939. In this short period, in addition to regular members of the Board who are *ipso facto* subscribers of the journal, the number of non-member subscribers has already reached about 500, from almost all parts of India, and some even outside India. Of these non-member subscribers no less than 215 are from outside the Punjab.

Other Publications.—In addition to the above, interesting bulletins on fruit industries of Egypt, Palestine, Italy and Sicily, France and Switzerland, and Kashmir were also published in 1938, based on the observations, made by Sardar Sahib Sardar Lal Singh, the Government Fruit Specialist, during his tour through those countries. These have also proved remunerative to the Board.

It is now proposed to still further extend publication activities by bringing out standard books on horticulture and fruit price supplements, etc.

Besides the propaganda side, the Board is now taking up a number of very important beneficial schemes which have a far reaching bearing on the future of the provincial fruit industry. These have been enumerated below.

1. Bud Selection Programme.—Most of the fruit trees in the Punjab Gardens are generally of very inferior varieties and they bear either very light crops or give fruits of very poor quality. The orchards bearing heavily and producing fruit of excellent quality are few and far between. It requires no prophet to foresee what a remarkable change in the provincial fruit

industry could be brought about if these selected trees were used for propagation of nursery plants.

Considering all this, the Board has launched a very comprehensive programme from this citrus season to survey the leading orchards of the province and to locate trees of outstanding merit and arrange to obtain budwood, cuttings, etc., therefrom, for multiplying in thousands, plants of quality at the central Nursery to be organised at Lyallpur. Already over 325 trees of merit have been marked out by the Bud Selection Supervisor of the Board, and the scheme holds a promising future in the next season. Such schemes have given very satisfactory results in foreign countries and there is no reason why we should not have equally encouraging results here in the Punjab.

2. Fruit Marketing Activities.—Another important matter which is engaging the close attention of the Board is to provide facilities for proper marketing of the Punjab fruits; as production alone cannot lead to a successful development of the fruit industry. With this end in view various alternative proposals have been engaging the attention of the Committee for the last four years. But it is very much regretted that due to various stumbling blocks coupled with that of financial stringency, the Committee has not so far been able to give a start to any of the deliberated schemes.

One of the central items of the programme had been to organise a central provincial fruit market at Lahore under the auspices of the Board on the Nazul plot outside Shahalmi Gate, Lahore,—Lahore being the biggest distribution

and consumption centre for fruits in the province. This proposal has now taken entirely a new orientation in view of the undertaking of the Lahore Municipal administrator to organize the needed Central Fruit Market under the municipal control.

Under the circumstances, the Board is now considering to take up other items of the reformatory fruit marketing programme on the basis of a very comprehensive scheme costing over Rs. 4,000|- per year drafted by the Marketing Officer, Punjab. The salient features of the new proposals are :—

1. Organisation of fruit supply centres in the districts to introduce better grading and packing methods; and establishing a network of approved commission agents in and outside the province.

2. To encourage better direct methods of marketing by purchasing produce of some good gardens and arranging to market the fruit by the Board as an experimental measure.

3. To open a model Fruit Retail Stall in the Tollinton Market for starting a vigorous campaign to push quality graded fruit to the gentry of the metropolis, which experiment, if successful, is to be extended to the districts.

3. Parliamentary Activities

Assembly Members "Fruit Group."—Another important accomplishment of the Board has been the creation of a strong organization under the name and style of "Assembly Members Fruit Group" on non-party lines, in the Punjab Legislative Assembly for protecting the interest of the provincial fruit industry.

The "Fruit Group" has been unusually active in the 1939 budget session in organising deputations on the Punjab Ministers, tabling resolutions for the promotion of the provincial fruit industry; which culminated in forwarding a weighty memorandum signed by sixty M.L.A.'s, mostly from the government benches. The Leader of the Opposition of the Punjab Legislative Assembly also issued a similar press statement in support of the fruit industry.

4. Other Activities

Irrigation & Revenue Standing Committee.—There is yet another important problem in the solution of which the organisation of the Board has contributed a great deal. As a result of a number of representations and deputations of the Board, the Irrigation Department has tentatively agreed to restore the concession for a double supply of water for orchards of the province, so long as the area under fruits on any canal does not exceed $\frac{1}{2}$ % of the total commanded culturable area and 2% on any one distributary. Efforts are now being made to implement the decision so arrived at. The Board has also been devoting its attention in removing other standing grievances of the fruit growers, e.g. removing the injustice of charging land revenue, *malkana*, *abiana*, twice a year on the fruit gardens while the trees bear crop only once a year and also to secure *Kharaba* concession for the fruit orchards.

Another notable activity has been to devise measures for protection and development of the fruit preservation industry in the Punjab. One of the sub-committees of the Board drafted a detailed scheme of introducing "National Mark Scheme" to ensure the manufacture of fruit products under hygienic and

sanitary conditions, and to regulate the fruit preservation industry on right lines.

Finances.—The finances of the Board are not yet on sound footing. Due to conservative financial policy, the Board has built a fair bank balance of Rs. 8,152/7/3 per balance sheet as on 31/7/1939, notwithstanding very little government aid. But with the start of various beneficent programmes from this season e.g. bud selection, etc. etc., the earned resources are far from sufficient to meet the recurring demands. Although the Board's present recurring expenses are estimated to touch Rs. 750/- a month or so in the near future, the Board has so far received only a meagre non-recurring grant of Rs. 2,500/- per year during the years 1938 and 1939. It would not be out of place to mention that the U.P. Fruit Development Board—a sister organisation, has been enjoying an annual subsidy of Rs. 4,000/-

since its inception in the year 1933 which was subsequently raised to Rs. 8,500/- per year. The inadequacy of the financial support from the government has seriously stood in the way of extending the beneficial activities the Board has in view. The Board has chalked out a very comprehensive programme for the promotion of the fruit industry in the province on all fronts, a detailed mention regarding which will be made in the next issue of the journal.

With a view to finance the schemes of the new year as well as to make organisation of the Board self-contained and self-sufficient, one of the proposals which is now under consideration is to raise the Board into a statutory body on the lines of the Indian Tea Cess Committee; Cotton Cess Committee, Coffee Cess Committee, etc., which, if accomplished, would ensure liberal finances for the promotion of the provincial fruit industry.

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مکتبہ مالٹا کی قسم کے پودہ جات کی خرید کیلئے
 محکمہ ہائے زراعت پنجاب اور شمال مغربی صوبہ سرحد سے
 منظور شدہ اور پنجاب فروٹ نمائش میں اول درجہ و
 دیگر انعامات حاصل کرنے والا، ساتس کے اصولوں پر
 قائم کردہ اور بڑے پیمانہ کا قابل اعتماد ذخیرہ (زرسری)۔
 تشریف لائیے اور ملاحظہ فرمائیے۔
 دیگر تفصیلات و نرخ نامہ مفت طلب یہ کیجیے۔

دی پاپولر نرسریز و فروٹ فارم گو جرانوالہ پنجاب

Are you a Member?

by

Mr. K. L. Kohli, Asst. Secretary,

Pb. P. C. Fruit Development Board.

As a very large number of inquiries are being received from all over India about the working of the Punjab Fruit Development Board, the privileges of its membership and fees thereof, we take this opportunity to enlighten the readers with the salient features of the working of this organisation of the fruit growing community of the Punjab province.

Privileges of Membership.—Although the membership of the Board is on purely voluntary basis it is gratifying to note that it has met with phenomenal response from the public. Leading men of the Punjab belonging to all walks of life—retired civilians, engineers, doctors, judges, advocates, M.L.A.'s and others, have rallied round the Board and are enthusiastic supporters of its aims and objects. There are about 473 members of the Board and the number is sure to increase in view of the new beneficent programmes started this season.

His Excellency the Governor of the Punjab and the Hon'ble Minister for Development are the patron and vice-patron of the Board respectively. The Managing Committee of the Board comprises 30 important officials and public men representing all shades of opinions.

The office-bearers of the Board for the year 1939 were the following:—

1. The Hon'ble Ch. Sir Shahab-ud-Din, 3, Durand Road, Lahore—(President).
2. The Hon'ble Mr. Justice Bakhshi Tek Chand, Judge High Court, Lahore—(Vice-President).
3. S. S. Lal Singh, Government Fruit Specialist, Lyallpur—(Hony. Secretary).
4. Ch. Mushtaq Ahmad, P.V.S. (Class I), Veterinary College, Lahore—(Joint Secretary).
5. L. Mehar Chan Mahajan, Advocate, 23, Abbott Road, Lahore—(Treasurer).

Some of the privileges, the members of the Board are now entitled to, are:—

(1) The copies of the Punjab Fruit Journal including Special Numbers, if any, are supplied gratis to the members. Ordinarily annual subscription of the Journal alone is Rupees two.

(2) The members can book orders through the Board for various gardening requirements, e.g., garden tools, manures, packages, etc., at concession rates.

(3) The members can sell fruits through the Board from this citrus season. For this purpose a chain of dependable "Arthias" (Commission Agents) throughout the province and outside is being established, under

the guidance of the Marketing Officer, Punjab.

(4) The members are expected to be immensely benefitted by the recently started Bud Selection Programme, consisting of surveying the orchards of the province, locating fruit trees of outstanding merit and arranging their multiplication in thousands.

(5) The Board now renders free technical advice and practical assistance to its members in various matters relating to fruit culture and fruit preservation.

The Irrigation Department, has agreed to give "Double Wari" for gardens. Members can now send in their applications for the enhanced supply to the office of the Board at an early date.

Membership Fees and Rules

The members are classed and designated as below according to the amount of subscription paid by them :—

(1) Life Members: Any member paying a subscription of Rs. 50/- in advance, or by instalments of Rs. 10/- per month is eligible to become a life member.

(2) Regular Members: Any member paying an annual subscription of Rs. 6/- in advance is eligible to become a regular member.

(3) Ordinary Members: Any person paying an annual subscription of Rs. 3/- in advance is eligible to become an ordinary member.

(4) Society or Association Members: Every such society or association shall pay a subscription of Rs. -[8]- in advance per annum for each of its members and on payment of such sub-

scription shall be entitled to be represented on the Board by one representative for every ten of its members.

(5) Honorary Member: Any person whom the Managing Committee may specially elect as an honorary member for obtaining his advice and assistance in any matter.

The liability of each member is limited to the extent of his subscription and thus the fruit growing public is invited to join this representative body of the fruit growing community, unhesitatingly.

At present the office of the Board is attached with the office of the Fruit Specialist, Punjab, Lyallpur. It is intended to open a central office of the Board at Lahore and branches in other districts. For further particulars kindly communicate with the Honorary Secretary of the Board at Lyallpur.

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The Fruit Specialist, Punjab and his staff and other contributors
to the Punjab Fruit Journal.

Leaflets on Fruit Culture and Fruit & Vegetable preservation available for free distribution with the department of Agriculture.		No. of Leaflets	Subject
No. of Leaflets	Subject		
40	1. Harmful effects of close Planting.	81	and packing of oranges in standard size boxes.
	2. Various methods of laying out of gardens.	95	Protecting fruit trees from frost.
	3. Distances necessary for various kinds of fruit trees.	109	Preparation of jelly from fruits.
41	Heading back young nursery trees.		Topworking of "Ber" trees.
42	Preparation of mango "Chutney."	114	General hints on manuring of oranges.
44	1. Study of soil for fruit gardens.	115	A note on various varieties of fruits grown in the Simla Hills.
	2. Soil requirements of important fruit trees.	153	Phalsa Cultivation.
51	Protecting trees from Sunburn.	154	Phalsa Syrup.
58	Candying "Bers."	155	Preparation of lemon or lime squash and lime juice cordial.
61	Cultivation of Strawberries.		Canning of pears.
64	How to make Orange marmalade.		Preparation of Orange squash.
68	Selection of plants.		
69	Wind breaks.		
70	Planting of gardens.		
73	List of reliable nurseries.		
77	Preparing tomato Ketchup.		
78	Candying fruits.		
79	How to place oranges in the market i.e. instructions regarding picking, grading, wrapping		
LEAFLETS ON INSECT PESTS AND DISEASES			
		9	Citrus psylla (Diaphorina citri).
		30	Field rats and their control.
		32	The Mango Hoppers and their control.
		88	San Jose Scale and its control.
		102	Fruit flies.
		94	On Bordeaux mixture and its preparation.
		101	Citrus canker and its control.

- 107 Some important diseases of citrus plants. (Malta, Sangtra, Lemon, etc.) and their control measures.

PUBLICATIONS

I. Fruit Culture.

1. "Pruning of fruit trees: The effect of dormant pruning on cropping and vegetative vigour of Phalsa (*Grewia asiatica*)" by S. S. Lal Singh & Dr. Sham Singh. Published in the Indian Journal of Agri. Science Vol. VIII part 3, June 1938.

2. "The distinguishing characters of Grapevine varieties introduced at Lyallpur in the Punjab" by Lal Singh & Sham Singh. (Sent up for publication)

3. "Relation of Growth to fruit bearing in Mangoes." by Lal Singh & Abdul Aziz (accepted for publication by the I.C.A.R. and is in press).

4. Fertilizer experiment with Sweet Oranges (Malta Orange) growing on rough lemon by Lal Singh, Bal Singh and Abdul Aziz. (sent up for publication).

II. Fruit Preservation.

1. Studies on the preservation of fruits and vegetables.

"An investigation on the methods of preparation and standardization of tomato ketchup" by Lal Singh & Girdhari Lal (Being a special Bulletin of the Punjab Agriculture Department 1936) and Reprinted as a Special Bulletin of the Imperial Council of Agricultural Research 1939).

2. Studies in the Preservation of Fruit Juices.

(i) "Some observation on the preparation and preservation of citrus fruit

squashes" by Lal Singh & Girdhari Lal Published in the Indian Journal of Agri. Science Vol. VIII part I Feb., 1938.

3. "Studies in the Preservation of Fruit Juices."

(ii) "Experiments on the preparation and preservation of unfermented apple juice." by Lal Singh & Girdhari Lal (accepted for publication by the I.C.A.R.)

4. "Semi-commercial trials on the manufacture of Canned Pears (Williams) and Pear Jam at Lyallpur" by Lal Singh & Girdhari Lal (Sent up for publication).

III. Bulletins published by the Punjab P.C. Fruit Development Board Ltd.

(1) Four Bulletins on Fruit Industries of Egypt, Italy & Sicily Island and France & Switzerland, by S. S. Lal Singh B.Sc. (Hons.), M.Sc. (Calif.).

Part I Fruit industry of Egypt.

Part II Fruit industry of Palestine.

Part III Fruit industry of Italy & Sicily island.

Part IV Fruit industry of France & Switzerland.

(2) "Kashmir Fruit Industry" by S. S. Lal Singh & S. Bal Singh.

FRUIT DEVELOPMENT BOARD

1. Ourselves:—Vol. I, January 1937, No. 1; Vol. 2, January 1938, No. 4 & 5.

2. Speeches of His Excellency the Governor, Punjab and the President of the Fruit Development Board. Vol. 1. Jan. 1937, No. 1.

3. A Summary of the Board's activities Vol. 1 Jan., 1937, No. 1.

4. Are you a member? Vol. 1, January 1937, No. 1.
5. District Awakening Vol. 1, January 1937, and Vol. 1. April 1937, No. 2.
6. Accounts of the Punjab Provincial Co-op. Fruit Development Board Vol. 1, Jan. 1937, No. 1.
7. Water for Gardens. Vol. 1, Sept. 1937, No. 3.
8. Fruit Movement makes Headway Vol. 1, Sept. 1937, No. 3.
9. Ourselves. Vol. 2, January 1938, No. 4 & 5.
10. The Annual meeting and afterwards:—Vol. 2, April 1938, No. 6.
11. The Punjab Fruit Co-operative Movement of the Presidential Address of the Hon'ble Ch. Sir Shahab-udDin, delivered at the annual meeting of the Board) Vol. 2, April 1938, No. 6.
12. The Punjab Ministry determined to Develop Fruit Industry.
(The Annual Address of the Hon'ble Ch. Sir Chhotu Ram, Minister of Development, Punjab, delivered at the annual meeting of the Board) Vol. 2, April 1938, No. 6.
13. The annual report of the working of the Board for the year ending December, 1937—presented by S. S. Lal Singh, B.Sc. (Hons.), M.Sc. (Calif.), Honorary Secretary, Punjab Provincial Co-op. Fruit Development Board. Vol. 2, April 1938, No. 6.
14. Annals of the Board. Vol. 2, April 1938, No. 6.
15. Annals of the Board. Vol. 2, July 1938, No. 7.
16. Annals of the Board. Vol. 2, October 1938, No. 8.
17. Annual General Meeting of the Punjab P.C. Fruit Development Board Vol. 3, Jan. 1939, No. 9.
18. Water for Gardens. Vol. 3, January 1939, No. 9.
19. Annual Report of the Punjab P.C. Fruit Development Board for the year ending Dec. 31, 1938, Vol. 3, April 1939, No. 10.
20. Annals of the Board, Vol. 3, April 1939, No. 10.
21. Annals of the Board Vol. 3, July 1939, No. 11.
22. Presidential Address of the Hon'ble Ch. Sir Shahab-ud-Din Vol. 3, April 1939, No. 10.
23. The Press Summary of the speech of H. E. Sir Henry Duffield Craik, Bart, K.C.S.I., I.C.S., Governor of the Punjab, Vol. 3, April 1939, No. 10.

GENERAL FRUIT CULTURE ETC.

1. Message from His Excellency the Governor, Punjab, Vol. 1 January 1937, No. 1.
2. Message from Hon'ble Ch. Sir Shahab-ud-Din, Kt. Vol. 1, January 1937, No. 1.
3. Fruit Industry in India Vol. 1, January 1937, No. 1.
4. Fruit Growing—An attractive Profession Vol. 1, Jan. 1937, No. 1.
5. Fruit Growing in the Punjab—being the speech of Sir Jogendra Singh

delivered at the Punjab Fruit Show, January, 1937. Vol. 1, April 1937 No. 2.

6. Fruit Industry:—A review of recent Development—being the speech of H. R. Stewart, Esq., Director of Agriculture, (Punjab) delivered at the Punjab Fruit Show. Vol. 1, April 1937, No. 2.

7. Is there real danger of over production of fruit in the Punjab. Vol. 1, Sept. 1939, No. 3.

8. Fruit Growing in India—Speech delivered by Mr. N. C. Mehta, I.C.S., on the occasion of the first all India meeting of the Horticultural Research Workers held in September, 1937, at Simla. Vol. 2, January 1938, No. 3.

9. Fruit Industry in other countries. Vol. 2, Jan. 1938, No. 3.

10. A review of Bulletins on Fruit Industry in foreign countries. Vol. 2, April 1938, No. 6.

11. A note on the Kulu Valley Fruit Industry. Vol. 2, July 1938, No. 7.

12. Radio Talk on Fruit Industry. Vol. 2, Oct. 1938, No. 8.

13. A message to Punjab Fruit Growers. Vol. 3 January, 1939 No 9.

14. An appreciation of the alround progress in Fruit Culture and Fruit Preservation. Vol. 3, April 1939, No. 10.

15. Review of the Fruit Industry in the Punjab. Vol. 3, April 1939, No. 10.

16. M.L.A's manifesto on the Provincial Fruit Industry. Vol. 3, July 1939, No. 11.

17. Importance of the Fruit Growing Industry. Vol. 3, July 1939 No. 11.

18. Equilateral system of laying out orchards. Vol. 3, Oct. 1939, No. 12.

CITRUS FRUITS

1. Pruning Orange Plants. Vol. 1, Jan. 1937, No. 1.

2. Sunburn of Citrus Fruits. Vol. 1, Jan. 1937, No. 1.

3. Mottle Leaf Disease in Citrus and its control. Vol. 1, Jan. 1937, No. 1.

4. Root stocks for Citrus Fruits. Vol. 1, April 1937, No. 2.

5. Budding Season of Citrus Trees. Vol. 1, April 1937, No. 2.

6. A plea for starting Bud-Selection work. Vol. 1, April 1937, No. 2.

7. Citrus Tree Shape & Production. Vol. 2, July 1938, No. 7.

8. Uses of Kaghzi Lime (Kaghzi nimboo) Vol. 2, July 1938, No. 7.

9. Sooty mould of citrus plants & its control. Vol. 2, July 1938, No. 7.

10. A new method of propagating kaghzi nimboo (citrus aurantifolia, Swingle) and its bearing on the development of Lime Fruit Industry. Vol. 2, Oct. 1938, No. 8.

11. Citrus Bud Selection. Vol. 2, Oct. 1938, No. 8.

12. Valencia Late Orange as an introduced Variety in Assam. Vol. 2, Oct. 1938, No. 8.

13. Citrus Canker and its Control. Vol. 2, April 1938, No. 6.

MANGO

1. Standardization of mango culture in India. Vol. 1, January 1937, No. 1.

2. Improvement of mangoes in the Punjab. Vol. 2, Jan. 1938, Nos. 4 & 5.

3. The Mango Number. Vol. 3, July 1939, No. 11.

4. Vitamin contents of Mangoes. Vol. 3, July 1939, No. 11.

5. Relation of growth to bearing in Mangoes. Vol. 3 July 1939 No. 11.

6. Alternate Bearing in Mangoes. Vol. 3, July 1939, No. 11.

7. Propagation of Mangoes in the Punjab. Vol. 3, July 1939, No. 11.

8. Budding of Mangoes. Vol. 3, July 1939, No. 11.

9. Limitation of Mango Varieties. Vol. 3, July 1939, No. 11.

10. Trials on the Export of Mangoes from Bombay to Europe. Vol. 3, July 1939, No. 11.

11. Important Pests of Mangoes and how to combat them, Vol. 3, July 1939, No. 11.

12. Diseases of Mango in the Punjab. Vol. 3, July 1939, No. 11.

PAPAYA

1. Demand for Dried Papaya from Overseas. Vol. 2, Oct. 1938, No. 8.

2. How to grow Papaya. Vol. 3, Jan. 1939, No. 9.

STRAWBERRY

1. Strawberry Culture. Vol. 3, Oct. 1939, No. 12.

BER

1. The Punjab Ber Trees. Vol. 1, Jan. 1937, No. 2.

PROPAGATION OF FRUIT TREES

1. Directory of Punjab Nurseries. Vol. 1, January 1937, No. 1.

2. Root Stocks for citrus Fruits. Vol. 1, January 1937, No. 1.

3. Budding Season of Citrus Trees—Some Practical Hints—Vol. 1, April 1937, No. 2.

4. A Plea for Starting Bud-Selection Work. Vol. 1, April, 1937, No. 2.

5. A new method of propagating the kaghzi nimboo (*Citrus aurantifolia*, Swingle) and its bearing on the development of lime industry. Vol. 2, October 1938, No. 8.

6. Citrus Bud Selection Vol. 2, October 1938, No. 8.

7. Propagation of mangoes in the Punjab. Vol. 3, July 1939, No. 11.

8. Budding of mangoes. Vol. 3, July 1939, No. 11.

Pruning

1. Pruning Orange Plants. Vol. 1, January 1937, No. 1.

2. Physiology and Nutrition of Pruning. Vol. 1, September 1937, No. 3.

3. Citrus Tree Shape and Production. Vol. 2, July 1938, No. 7.

4. Fruiting Habit of fruit trees as related to their pruning. Vol. 3, October 1939, No. 12.

Irrigation

1. Water for Gardens. Vol. 1. September 1937, No. 1.

2. Economic Tube well Irrigation. Vol. 2, Nos. 4 and 5.

3. Water for Gardens. Vol. 3, April 1939, No. 10.

Seasonal Hints on Gardening Operations

1. Seasonal Hints for improving old gardens. Vol. 1, January 1937, No. 1.

2. Seasonal Hints for planting new Gardens. Vol. 1, January 1937, No. 1.

3. Seasonal Hints. Vol. 1, April 1937, No. 2; September 1937, No. 3; Vol. 2, January, 1938, Nos. 4 & 5, Vol. 3, July 1939, No. 11.

4. A. B. C. of important Horticultural operations. Vol. 2, April 1938, No. 6.

Diseases, Insect Pests and Other**Disorders**

1. Mottle Leaf Disease in Citrus and its Control. Vol. 1, Jan. 1937, No. 1.

2. Citrus Canker and its Control. Vol. 2, April 1938, No. 6.

3. Protection of Fruit Trees from Sunburn. Vol. 2, July, 1938, No. 7.

4. Sooty mould on Citrus Plants and its Control. Vol. 2, October 1938, No. 8.

5. Fruit Fall of Citrus and its Control. Vol. 2, October 1938, No. 8.

6. Protection of Fruit Trees from frost. Vol. 3, January 1939, No. 9.

7. Splitting of Fruits. Vol. 3, January 1939, No. 9.

8. Important pests of mango and how to combat them. Vol. 3, July, 1939, No. 11.

9. Diseases of Mango in the Punjab. Vol. 3, July 1939, No. 11.

10. Potash Deficiency Symptoms in Fruit Trees. Vol. 2, July 1938, No. 7.

Storage and Transport

1. Importance of Cold Storage, Vol. 2, January 1938, Nos. 4 and 5.

2. A memorandum on the Hindustan Tibet Road. Vol. 2, January 1938, Nos. 4 and 5.

3. Trials on Export of Mangoes from Bombay to Europe. Vol. 3, July 1939, No. 11.

Marketing, Etc.

1. The Lahore Fruit Market. Vol. 1, September 1937, No. 3.

2. Some observations on the marketing of fruits in the Punjab. Vol. 2, January 1938, Nos. 4 and 5.

3. The Fruit Marketing Scheme. Vol. 2, January 1938, No. 4 and 5.

5. Will Lahore Municipal Administration Awaken to its Responsibilities? Vol. 2, July 1938, No. 7.

5. Grading of Oranges in the Punjab. Vol. 3, October 1939, No. 12.

Floriculture, Landscape Gardening, Etc.

1. Landscaping Bungalow Premises. Vol. 2, April 1938, No. 6.

2. Trees for your Bungalow Premises. Vol. 2, July 1938, No. 6.

3. What to do in your ornamental Garden during the Rainy Season. Vol. 2, July 1938, No. 7.

4. Cultivation of Jasmine. Vol. 3, January 1939, No. 9.

5. Fruit trees in Ornamental Gardens. Vol. 3, April 1939, No. 10.

Cold Region or Hill Fruits

1. Note on Varieties of Apples and Cherries recommended for Culture in commercial orchards in Simla. Vol. 2, January 1938, Nos. 4 and 5.

2. A note on Kulu Valley Fruit Industry. Vol. 2, July 1938, No. 7.

3. Fruit Industry in Murree Hills. Vol. 3, April 1939, No. 10.

4. Kashmir Fruit Industry. Vol. 3, October 1939, No. 12.

Varieties of Fruits

1. Some promising varieties of fruits. Vol. 1, January 1937, No. 1.

2. Note on the varieties of Apples and Cherries recommended for culture in Commercial Orchards in the Simla Hills, Vol. 2, January 1938, Nos. 4 and 5.

3. A note on Fruit Breeding in India. Vol. 2, January 1938, Nos. 4 and 5.

4. Valencia Late Orange as an introduced variety in Assam. Vol. 2, October 1938, No. 8.

5. Distinguishing Characters of some promising varieties of important fruits grown in the Punjab. Vol. 3, January, 1939, No. 9.

6. Limitation of mango varieties. Vol. 3, July 1939, No. 11.

7. Kashmir Fruit Industry. Vol. 3, October 1939, No. 12.

Fruit Shows and Fruit Short Courses

1. Advanced Fruit Preservation Course in the Punjab Agricultural College, Lyallpur. Vol. 2, April 1938, No. 6.

2. A note on the preparation of Exhibits for fruit Shows. Vol. 3, January 1939, No. 9.

3. Provincial Fruit Show Lahore, 1938. Vol. 3, January 1939, No. 9.

Fruit & Vegetable Preservation

1. Fruit Preservation Industry in the Punjab. Vol. 1, January 1937, No. 1.

2. Preparation and preservation of citrus fruit squashes and cordials. Vol. 1, April 1937, No. 2.

3. Tomato juice, its preparation and preservation. Vol. 1, September 1937, No. 3.

4. Some of the obstacles in the development of fruit preservation industry. Vol. 2, January 1938, Nos. 4 and 5.

5. Recent development in the canning of fruit juices. Vol. 2, January 1938, Nos. 4 and 5.

6. Preparation of tomato ketchup. Vol. 2, April 1938, No. 6.

7. Radio talk on fruit preservation. Vol. 2, July 1938, No. 7.

8. Preparation of Lemon-Barley Water. Vol. 2, July 1938, No. 7.

9. The use of artificial fruit flavours in the fruit preservation industry. Vol. 2, July 1938, No. 7.

10. Preparation of jams and jellies. Vol. 2, July 1938, No. 7.

11. Bottling fruit at home. Vol. 2, October, 1938, No. 8.

12. Demand for dried pawpaw from overseas. Vol. 2, October 1938, No. 8.

13. Citrus by-products. Vol. 3, January 1939, No. 9.

14. Dried vegetables. Vol. 3, January 1939, No. 9.

15. The use of silver ions in fruit preservation. Vol. 3, January 1939, No. 9.

16. The use of pure fruit syrups in milk beverages. Vol. 3, January 1939, No. 9.

17. Canning of green peas. Vol. 3, January 1939, No. 9.

18. Preparation of mango products. Vol. 3, July 1939, No. 11.

19. Candying of ginger. Vol. 3, October 1939, No. 12.

20. Canning of pears. Vol. 3, October 1939, No. 12.

Health Notes, Vitamins, Etc.

1. Why fruit cures succeed. Vol. 2, April 1938, No. 6.

2. Health value of apple juice. Vol. 2, July 1938, No. 7.

3. Health Notes. Vol. 2, July 1938, No. 7; Vol. 2, October 1938, No. 8; Vol. 3, January 1939, No. 9; Vol. 3, April 1939, No. 10; Vol. 3, July 1939; and Vol. 3, October 1939.

4. Vegetables for healthy diet. Vol. 3, April 1939, No. 10.

5. Vitamin contents of the mangoes. Vol. 3, July 1939, No. 11.

Vegetables

1. Cultivation of lettuce. Vol. 2, July 1938, No. 7.

2. Some hints on vegetable growing in the Punjab. Vol. 2, October 1938, No. 8.

Fruit News

1. News and notes. Vol. 1, January 1937, No. 1.

2. Chronicle of the fruit world. Vol. 2, April 1937, No. 2; Vol. 1, September 1937, No. 3; Vol. 2, January 1938, Nos. 4 and 5; Vol. 2, April 1938, No. 6.

3. Local and Provincial. Vol. 2, January 1938, Nos. 4 and 5.

4. Chronicle of the fruit world. (Indian Section also Foreign Section). Vol. 2, July 1938, No. 7; Vol. 2, October 1938 No. 8; Vol. 3, Jan. 1939, No. 9; Vol. 3, April 1938, No. 10; Vol. 3, July 1939, No. 11; Vol. 3, October 1939, No. 12.

5. Twelfth international horticultural Congress. Vol. 3, October 1939, No. 12.

Research or Research Extracts

1. Recent tendencies in fruit research work in the Punjab. Vol. 1, Jan. 1937, No. 1.

2. What the scientists say?—Being extracts from scientific papers and journals. Vol. 1, April 1937, No. 2; Vol. 1, September 1937, No. 3.

3. Horticultural knowledge from far and near. Vol. 2, January 1938, Nos. 4 and 5; Vol. 2, April 1938, No. 6; Vol. 2, July 1938, No. 7; Vol. 2, October 1938, No. 8; Vol. 3, January 1939, No. 9; vol. 3, April 1939, No. 10; Vol. 3, July 1939, No. 11; and Vol. 3, October 1939, No. 12.

Miscellaneous

1. Free popular leaflets. Vol. 1, January 1937, No. 1.

2. Preservation of museum specimens Vol. 1, January 1937, No. 1.
3. Formation of a fruit group. Vol. 1, April 1937, No. 2.
4. Some salient points about nitrogen carrying fertilizers. Vol. 1, September 1937, No. 3.
5. A new bird-frightening device. Vol. 1, September 1937, No. 3.
6. A review on "the Gardener" magazine. Vol. 2, Jan. 1938, Nos. 4 and 5.
7. Reviews. Vol. 2, April 1938, No. 6.
8. House of Pocha (a Review). Vol. 2, July 1938, No. 7.
9. Preparation and use of Bordeaux mixture as a fungicide. Vol. 2, July 1938, No. 7.
10. Instructions regarding the import of plants from foreign countries. Vol. 2, October 1938, No. 8.
11. The Punjab National Bank Ltd. (A Review). Vol. 2, October 1938, No. 8.
12. The Honey bee and fruit plants. Vol. 3, January 1939, No. 9.
13. Reviews. Vol. 3, January 1939, No. 9.
14. This War—Why should the Punjab take a hand in it. Vol. 3, October 1939, No. 12.
15. Service of Electricity to fruit culture. Vol. 3, October 1939, No. 12.
16. Chemicals for fruit industry. Vol. 3, October 1939, No. 12.
17. "Kissan." Vol. 3, October 1939, No. 12.

Appendix No. I

Names of the varieties of different fruits under trial in the Experimental Gardens at Lyallpur and in some other Government gardens

Citrus Fruits

(i) **Malta Orange.**—1. Italian; 2. Lahore local; 3. Agra local; 4. Valencia late, (Australia); 5. Solon (Khaltoo Orchards); 6. Blood red (Gujranwala); 7. Washington navel; 8. Ruby (Solon); 9. Common; 10. Common Gujranwala; 11. Blood red Australia; 12. St. Michael; 13. Naval Thompson improved; 14. Vanielle; 15. Excellencis; 16. Seville; 17. Jaffa; 18. Musambi; 19. Blood red (Lyallpur); 20. Dulcis; 21. Blood red, (Chak 213); 22. African; 23. Du Roi; 24. Valencia late, (South Africa); 25. Pine apple; 26. Hamlin; 27. Washington navel seedless; 28. Blood Red, (R.B. Barkat Ram); 29. Blood red (Mission Ahata, Gujranwala); 30. Teneriffe.

Names of Varieties of Malta Orange Imported from U.S.A. in 1939

1. Mediterranean Sweet; 2. Washington navel; 3. Ruby blood; 4. St. Michael; 5. Jaffa; 6. Hamlin; 7. Lue-Gim-Gong; 8. Parson brown.

Strains of Malta Orange of Outstanding Merit Collected from Different Places in the Province from 1935-1939

1. Bloodred, Hari Singhwala; 2. Blood red, Wadhai Cheema; 3. Blood red, Sardarwala; 4. Blood red, Montgomery; 5. Blood red, Gangapur,

6. Blood red, Gujranwala; (New seed farm Sargodha); 7. Callibrian red; 8. Blood red, Popular Nurseries Gujranwala; 9. Blood red, Nazir Nursery, Gujranwala; 10. Blood red, Bakhshi Kanhya Lall; 11. Blood red Parkarabad.

Names of Varieties of Malta Orange Under Trial at Government Farm, Sargodha

1. Common, Lyallpur; 2. Blood red, Lyallpur; 3. Excellencis; 4. Washington navel; 5. Ruby blood; 6. Golden Nagget; 7. St. Michael; 8. Musambi; 9. Australian navel; 10. Blood red, Gujranwala; 11. Manielle; 12. Whitekar; 13. Common Muzaffargarh; 14. Callibrian blood; 15. Italian; 16. Common Agra; 17. Thin skinned blood red, Gujranwala; 18. Blood red, Australia; 19. Valencia late.

(ii) Sangtra.—(Lyallpur garden)

1. Sangtra (Nagpur); 2. Sangtra, (Saharanpur); 3. Sangtra (Agra); 4. Sangtra (Lahore)—a selected strain; 5. Sangtra (Muzaffargarh); 6. Sangtra (Lyallpur) selected; 7. Laddu; 8. Mar-malade orange; 9. Sangtra (Poona); 10. Natal tight skinned Naartjee; 11. Cape Naartjee; 12. Beauty of Glen Retreat Naartjee; 13. Kokni; 14. Kaula; 15. Coorg; 16. Srinagar; 17. Satsuma; 18. Sangtra (Lahore).

Nagpuri Sangtras

19. Batwar; 20. Emperor; 21. Italian; 22. Nagpuri or sweet lime; 23. Nagpuri or Jamberi; 24. Nagpuri.

Varieties Imported from U.S.A. in 1939

25. Temple; 26. Wase Sutsuma; 27. Dancy tangerine; 28. King mandarin; 29. Kinnow mandarin; 30. Wilking mandarin; 31. Kara mandarin; 32. Algerian Tangerine.

**Names of Varieties of Sangtra Orange
Under Trial at Government Farm,
Sargodha**

1. Lyallpur selected, 2. Nagpur, 3. Common (Muzaffargarh), 4. Budded Poona, 5. Common (Agra), 6. Satsuma, 7. Marmalade orange, 8. Gujranwala local, 9. Best Indpur, 10. Laddu; 11. Coorg (budded), 12. Coorg (seedling), 13. Common (Lahore), 14. Srinagar, 15. Sargodha local, 16. Common (Saharanpur).

(iii) Grape Fruits

1. California wonder, 2. Walters, 3. Isabella, 4. Mongibello, 5. Foster, 6. Marsh seedless, 7. Duncan, 8. McCarty, 9. Triumph, 10. Imperial, 11. Nectar, 12. Pernambuco, 13. Budded Poona, 14. Thompson.

(iv) Limes & Lemons

1. Kaghzi lime (Saharanpur), 2. Kaghzi lime (Agra), 3. Kaghzi lime (Lahore), 4. K. lime (Mushtaq gardens), 5. K. lime (Bombay); 6. Kaghzi lime (Bangalore), 7. Lemon seedless (Nagpur), 8. Villa Franca, 9. European, 10. Eureka, 11. Ponderosa, 12. Berass seedless lime.

(2) Grapes

1. Tas, 2. Spin Savai, 3. Dakh, 4. Sursavai, 5. Hür, 6. Tor, 7. Jaishi, 8. Gatak, 9. Zanti currant, 10. Australian,

11. Sahib Ali, 12. Muscat Alexandria, 13. Tandan, 14. Hussaini, 15. Seedless, 16. Black Quetta, 17. Sheikh Ali, 18. Rose, 19. Kishmish red, 20. Kishmish white, 21. Green large seeded, 22. Diamond jubilee, 23. Madresfield court, 24. Gross colman, 25. Pruned Carzoul, 26. Oliveth-De-Vandemain, 27. Angulata, 28. Bakator, 29. Bellino, 30. Beau Blanc, 31. Gross sapat, 32. Portuguese blue, 33. Madalein Angevine, 34. Luglienga, 35. Damas rose, 36. Queen Golden, 37. Servan, 38. Paykani, 39. Chaouch, 40. Kartilaska, 41. Cornichon, 42. Doit-de-deisse, 43. Mavron, 44. Malaga, 45. Cipro nero, 46. Dizmar, 47. Bibier, 48. Palomino, 49. Chasselas rose, 50. Danuge, 51. Rish baba, 52. Agawam, 53. Iona, 54. Black prince, 55. Khalili, 56. Black Damascus, 57. Bucklands' sweet water, 58. Kharimurat, 59. Local, (Chak 45. G.B.), 60. Gujranwala local, 61. Kali sahebi, 62. Foster's seedling, 63. Kandhari, 64. Hussaini black kabuli, 65. Bhokari, 66. Fakadi, 67. Pandhari sahebi, 68. Waltham cross, 69. Black hampburgh, 70. Sultana seedless, 71. Muscat Lahore, 72. Unknown, 73. Thompson's seedless, 74. Convent large. Black, 75. Convent large white, 76. Dutch sweet, 77. Flame muscat, 78. Black muscat, 79. Almeria, 80. Banqi Abyad, 81. Catawba, 82. Black monukka, 83. Tokay, 84. Rose of Peru, 85. Sheriden, 86. Chasselas Neuschatel, 87. Emperor, 88. Concord, 89. Zinfandel, 90. Amber Queen, 91. Mission, 92. Isabella, 93. Canada, 94. Coethe, 95. Rose (M.T. Lahore), 96. Hern munson, 97. Baily, 98. Minnie, 99. Wapanucka, 100. Canada, 101. President, 102. Ellen Scot, 103. Beacon, 104. Champaneh, 105. Brilliant, 106. Lomanto, 107.

Mericadel, 108. Haitha, 109. Kishmish, 110. Chandukhani, 111. Blue grape (Bangalore), 112. Delaware, 113. Black diamond, 114. Dattier-de-Beyrouth, 115. Sultanina rosea; 116. Campbell.

Note.—Varieties from No. 77 to 116 are under trial for the last couple of years only.

Name of Varieties of Dates Under Trial

1. Hillawi, 2. Khudrawi, 3. Zaidi, 4. Shamran, 5. Zeri, 6. Sayer, 7. Mekran, 8. Mirpurkhas, 9. Berhi, 10. Awaidi, 11. Khasab.

Names of Banana varieties under trial.—1. Peyan, 2. Rastali, 3. Konda Monthan, 4. M. Bonthan, 5. Vellalur No. 1, 6. Vellalur No. 2, 7. M. Dacca marla bum, 8. M. Cavendish, 9. M. Kantali, 10. M. murtabum, 11. M. Kunch Kale, 12. Paichanadan, 13. Monthan, 14. Pachabala, 15. Naindiabala, 16. Kadalibala, 17. Rasabala, 18. Kilandi, 19. Imarti, 20. White chekrakela, 21. Karpura, 22. Chinna balai, 23. Bontha, 24. Bathisa, 25. Halili, 26. Sagundhubalai, 27. Gaju balai, 28. Raja balai, 29. Yalakhi Balai, 30. Puttubalai, 31. Devigoshia, 32. Ave Balai, 33. M. Champa, 34. Valah, 35. Kela Bansi, 36. Parachanar, 37. Basroi, 38. Kabuli, 39. Safed valechi, 40. Rajeli, 41. Lal valechi, 42. Paichailadan, 43. Sapari, 44. Hazara, 45. Rawalpindi, 46. Red, 47. Dorabalai, 48. Pind-dadan Khan, 49. Mauritius, 50. No. 84, 51. No. 80, 52. No. 81, 53. No. 79, 54. Maulwain, 55. Ramkela, 56. Elachi, 57. Elsi, 58. Kanai Bansi, 59. Chatin, 60. Rajpuri-Poona, 61. Bad-dobalai, 62. Agel Sebool alwaya, 63. Gruthelabim, 64. Rai Kela, 65. Kalibo,

66. China champa, 67. Amartaman, 68. Amritsari, 69. Dindigul, 70. Lonkel chanda, 71. Ialon, 72. Awak legor, 73. Raja udang, 74. Rajah, 75. Hijan, 76. Rastali, 77. Ps. vine No. 1, 78. Grewal Nursery, 79. Hazara Farm, 80. Desi Harappa.

Varieties of Mango under Trial at Lyallpur.—1. Mango (Parkarabad Estate), 2. Samar Bahishat Rampur, 3. Neelum, 4. Samar Bahisha Khajri, 5. Dr. King, 6. Be-Nazir kalan, 7. Alphonso Khas, 8. Mohd. Wala, 9. Mango (chak 213), 10. Lakhshman Bhog, 11. Rasपुरi, 12. Husaini, 13. Baramasi, 14. Fajri Bhagalpur, 15. Angbeen, 16. Langra Benarsi, 17. Langra Darbhanga, 18. Zafrani, 19. Aman Dusehri, 20. Krishan Bhog, 21. Sukhtara, 22. Asojia surkha, 23. Bacha Khangari, 24. Khassi Bhutapar, 25. Malda, 26. Mudhi Bhutapar, 27. Mudhi Taliri, 28. Chak Rohari, 29. Khira Bhutapar, 30. Karela, 31. Kankwala, 32. Khira (chak Rohari).

NAMES OF MANGO VARIETIES UNDER TRIAL AT OTHER GOVERNMENT FARMS IN THE PUNJAB

Gurdaspur.—1. Dr. King, 2. Sargodha, 3. Malgoa, 4. Moundhi, 5. Khangarhi, 6. Gondoo White, 7. Bara Malda, 8. Walaj Pasand, 9. Prithi, 10. Asojia surkha, 11. Alphonso, 12. Fajri Kalan, 13. Mohd Wala, 14. Langra Lyallpur, 15. Zafrani, 16. Anjbeen, 17. Totapari, 18. Sipya Shah Pasand, 19. Samar Bahisht Ali Bagh, 20. Be Nazir Kalan, 21. Samar Bahisht Rampur, 22. Anoria, 23. Aman Dusehri, 24. Gopal Bhog, 25. Sufaida, 26. Krishan Bhog, 27. Hathi jhul, 28. Naspati, 29. Surkha, 30. Kakaria, 31. Gola Rampur, 32. Bhadaria, 33. Bombay Green.

Attari.—1. Samar Bahisht Chaunsa, 2. Alphonso (Pocna), 9. Pairi, 10. Ram Samar Bahisht (Alibagh), 3. Anabi Gola, 11. Kailwa Durgai, 12. Neelum, 4. Alphonso Kalan, 5. Fajri zafrani, 13. Alphonso, 14. Malda, 15. Langra 6. Aman Dusehri, 7. Gopal Bhog, 8. Lyallpur.

Appendix No. 2

Names of varieties of different fruit & root stocks planted in the experimental fruit garden, Palampur.

Peach

Briggs Red May, Red Bird Cling, Tuscan, Lovell, J. H. Hale, Hales Early, Peregrine, Foster Peak Cling, Salway, Early Imperial, Millers Late, Opulent, Mayflower, Elberta, Bilyen Late, Balora Cling, Seller's Orange, Australian Saucer, C. O. Smith, Early Crawford, Yellow St. John, Rio Oso Gem, Alexander, Babcock, Sims Cling, Early Canada, South Haven, Tachibana, Muir, Tenshin, Heath Cling, Phillip's Cling, Premier, Gould's Early, Honey Dew, Delight, Lalarukh, Shahpasand, Quetta Beauty, Sherin, Lulu.

Plums

Methley, Meriposa, Climax, Satsuma, Burbank, Green gauge, Victoria, Czar, Wickson, Damson, Combination, Japanese, Becky Smith, Ruby Gem, Formosa, Kelsey's Japan, Santa Rosa, Appex Plumcot, Botan Cullin's Gauge, Franz Joseph, Chabot, Cox's Emperor, Norman, Quetshe-D-Italia, Alubukhara, Sweet Early, Quetta Gauge, Alucha, Yellow Drop, Sultan.

Almonds

Texas, Ne plus ultra, Drake, I. X. L., Nonpareil, Quetta thick shelled, Quetta thin shelled.

Apricots

Royal, Tilton, Blenheim, Moorpark, Newcastle, Hemskirke, Kashmiri, Sweet-Large, Booi, Safaida from Samli, French, Red (Surkh) from Samli.

Nectarines

Stanwick, Boston, Gold-Mine, Gower, Quetta.

Prunes

Tragedy, Sugar, Standard, French Improved.

Apples

Brambley's Seedling, Cox's Orange Pippin on No. 1, XVI, IX on XII, I, II, IX.

Worcester Pearmain, American Mother on XVI.

Lanes Prince Albert, James Grieve on XII, IX.

Golden Russet, Mr. Gladstone.

Beauty of Bath, Ribston Pippin, Red June on IX and XVI.

Yellow Newton Pippin, E. Spitzenburg, Rome Beauty, Delicious, Yellow Bell-flower, Gravenstein, Golden Delicious, Indo, Ben Davis, California, Fameuse, Jonathan, Red Astrachan, Rhode Island Greening, Winesap, White Pearmain, Rawless Janet, Blood Red, French Ambri, Kashmiri Sweet Ambri, Peesgood Nonsuch, Kaiser, Transparent-de-croncels, Rein De Reinette, Northern Spy, Reinettes grise du Canada in the Emek.

Pears

Bartlett, Winter Nelis, Flemish Beauty, Seckel, Beurre-D-Anjou, Twentieth-Century, Kiku Sui, Yokumo, Gion, Chojuro, Sierin, Nino Miya, Nitake, Beurre Bosc, Beurre Hardy, Doyenne du comice, Easter Beurre, Durondeau on Quince A and C, Conference on Quince A and C, Madaline, Kashmiri Nakh.

Cherries

Noire-de-Guben, Roundell, Governor, Napoleon, Black Tartarian, Elton, Bing, English Morello, Early Richmond, White Heart, Red Sweet, Late Sweet, Black Biggareau, Early Sweet, May Duke, Black Heart, Royal Sovereign, Early Rivers.

Persimmons

Yemon, Kuro-kuma, Mino Zuro, Hachiya, Jiro, Zenjimar, Hyakume, Twentieth Century, Fuyu, Delicious, Seedless, Kurram Valley Persimmon.

Chestnut

Spanish, Spanish Seedlings, Marron Combalé.

Walnuts

Kaghzi Kashmiri, Murree.

Pecans

Halbert, Nellis, Western Schley, Burkett, Caloro, Mahan, Success.

Citrus Fruits

Sangtra : Lahore Selected, Coorg, Nagpuri.

Malta Orange

Vanielle, Jaffa, Pine apple, Excellensis, Blood Red, Valencia Late, Seville, Dulcis, Mussarabi, Washington Navel, Hamlin.

Grape Fruit.

Marsh seedless, Foster, Duncan.

Limes.

Kagzi lime, Sweet lime.

Lemons

European, Eureka, Villa Franca.

Root Stocks

Apple Root Stocks.

East Malling No: I.

East Malling No: II.

East Malling No: IV.

East Malling No: VII.

East Malling No: IX.

East Malling No: XII.

East Malling No: XIII.

East Malling No: XVI.

Merton 779, Merton 793, Apple seedlings from California, Malus prunifolia (aphis resistant), Doucin, Wild apple from Palestine.

Pear Root Stocks

Shiara (*Pyrus* sp.), Shegal (*Pyrus* *Pashia*) from Kulu, Quince seedlings from Kulu, Malling Quince A, Malling Quince B, Malling Quince C, Quince seedlings from California, French pear, *Pyrus Calleryana* (Resistant to blight), *Pyrus Communis*, *Serotina* (Japan pear), *Toringo*, *Pyrus Ussuriensis*.

Cherry Root Stock

F. 12/1, F. 12/4, Black Muzzard cherry, Mahaleb, *Prunus serrulata* (Japan Mountain cherry).

Peach, Plum, Apricot & Almond Root Stocks

Brussels, Myrobolan B, Common plum, Pershore, Brompton, Common Mussel, Apricot seedlings, Peach seedlings, Almond seedlings.

Persimmon Root Stocks

Diospyros Lotus, *Diospyros Kaki*.

Loquat Root Stocks

Eriobotrya japonica.

Chestnut Root Stocks.

Castane Japonica.

Passion Fruit

Saharanpur, Jullundur.

Grapes

Seedless, Black Prince, Foster seedling, Kandhari, Dakh, Black Hamburg, Muscat.

Pomegranates

Kashmiri, Kandhari.

Pistachio

Kashmiri, Lyallpur.

Rose

Sucha Gulab.

Rose Apple

1. Saharanpur.

Cashew nut: Raised from seed obtained from Madras.

Litchi

Dehra Dun, Seedless Muzaffarpore, Seedless late, Durgapur, Rose Scented.

Olives

Ascolano, Mission, Manzanillo, Suri, Moriolo, Razzo-o-Franticin, Frantoio-Razzo, Barouni, Sevillano.

Berries

The Kosmo Black Berry, Himalaya Black Berry, Grandall's Early Black Berry, Cuthbert-Raspberry, Gardena Dewberry, Perfection Red currants.

Quince

1. Sweet.

Loquat

Tanaka, Matchless, Thomas Pride,

The 1940 Annual Meeting

The next Annual General Meeting of the Punjab Provincial Co-operative Fruit Development Board will be held on Wednesday, the 10th January, 1940, at 2-30 p.m., at the Town Hall, Lahore.

The agenda will consist of the following items:—

1. Presidential Address by the Hon'ble Ch. Sir Shahab-ud-Din; Kt. K.B., B.A., LL.B., President of the Board.

2. Annual Address by the Hon'ble Major Nawab Sir Sikander Hyat Khan, K.B.E. Premier of the Punjab.

3. Presentation of the Annual Report of the Board for the year ending 31st December, 1939, by the Hony. Secretary of the Board.

4. To review the progress of the Irrigation and Revenue Standing Committee, Vis-a-Vis, the question of enhanced supply of water for gardens and other allied problems.

5. To review the progress of the Bud Selection Standing Committee and finding ways for financing the Bud Selection Programme for surveying orchards of the province and to mark out trees of outstanding merit for production of nursery plants of pedigree stock for supply to members.

6. Proposal to raise the Punjab Fruit Development Board to a Provincial statutory body on the lines of statutory Committees appointed by the Government of India e.g. Cotton Cess Committee, Tea Cess Committee, etc., so that the financial position of the board could be consolidated and brought on sounder footings to extend the multifari-

ous beneficent programmes, including marketing, bud selection, propaganda, advisory work, supply of gardening requirements. e.g. garden tools, fertilizers, packages, etc.

7. To request the Punjab Government that fruits and vegetables may be declared as agricultural produce, in terms of the Punjab Agricultural Produce Markets Act, 1939 with a view to ensure better marketing conditions in the existing fruit and vegetable markets of the province.

8. Proposal to request the Government to appoint a committee of some members of the Punjab Legislative Assembly to examine the present conditions of the Punjab Fruit Industry and to recommend ways and means to develop the same on sounder lines. Further to request that the Punjab Fruit Development Board may be represented on the said committee.

9. Presentation of the Audit Report for the current year upto 31st July, 1939, with particular reference to the Balance Sheet and Accounts of the Board.

10. Election of the Managing Committee and office-bearers for the year 1940.

(b) Fixation of quorum and other rules for conducting Standing Committee and Sub-Committee meetings.

11. Miscellaneous.

The members are requested to attend the meeting punctually.

LAL SINGH (Sardar Sahib)

Hony. Secretary, Punjab P. C. Fruit Development Board, Lyallpur.

Commercial Glimpses

By

K. L. Kohli, M.A., L.S.G.D.

Leaders in Nursery Business.—The Punjab Unemployment Committee Report has viewed with concern the fact that the demand for reliable plants is far in excess of the supply. A passing reference has been made that, in the absence of a larger supply, people buy cheap Saharanpur plants of doubtful origin.

Over three decades of fair business dealings and India-wide connections of M/s. L. R. Brothers, Saharanpur—foremost nurserymen of Northern India—should belie the popular belief that Saharanpur is the stronghold of unreliable cheap plants of doubtful origin only. M/S. L. R. Brothers who are one of the approved and registered nurserymen of the U.P. Fruit Development Board, and are also recommended by various Agricultural Departments all over the country, have an extensive nursery of the choicest fruit plants. They are specialists in mango and citrus plants and have a large range of different varieties of the same.

This is one of the few nurseries patronised by His Excellency the Viceroy and Governor General of India and the Governor of the United Provinces.

LEADING MANUFACTURERS OF AMERICAN SPRAYERS INTRODUCE THEIR PRODUCTS IN THE INDIAN MARKET

The House of Hudson—is known all over U.S.A. as one of the leading manufacturers of sprayers, garden tools, pumps, poultry equipment, etc., having nine factories scattered all over America employing more than ten thousand hands. M/S. H. D. Hudson Co. are specialists in garden sprayers and have a wide range of the same from 5 oz. to 100 gallons capacity.

We are glad to note that M/s. Joshi Pandit & Co. 85 Anarkali, Lahore have been appointed as all India representatives of this renowned American firm and trust that these standard American sprayers will find a good market in their capable hands.

THE CYCLE KING

The romance of the rise of R. S. Janki Dass, M.A.—an enthusiastic fruit grower and member of the Executive of the Punjab Fruit Development Board—presents an interesting reading. R. S. Janki Dass started his career in November 1919, as a Cycle Importer at Karachi with a view to obtain predominance in the cycle trade in Sind and Baluchistan. Later in November 1923, with a view to procure a strong hold in the Punjab and N.-W. F. P. markets, the Punjab branch office was opened at Lahore which opened new avenues for all round business extension in U. P., C. P., and

Rajputana. By 1929, Messrs. Janki Dass and Co. secured the foremost position as cycle importers in India.

Not satisfied with a mere cycle import business the firm extended its activities to the manufacturing of perambulators, children bi-cycles, cycle frames, and other cycle accessories. This pioneer attempt has met with considerable success in the field of commerce and has now been housed in their own spacious premises near Lahore Cantonment Station. The day is not far when we will have complete Indian made cycles out in the market from this factory.

"GHAR-KI-BIJLI

Fruit growers and Zamindars often feel the necessity of electric light on their farms as also for domestic lighting. The difficulty has been the high initial cost. This problem has to a very great extent been solved by Messrs Saroup & Bansilal Ltd., Engineers, The Mall, Lahore, who have introduced an extremely light portable set called 'Ghar-Ki-Bijli.' This set, we understand, can be had complete with battery for about Rs. 455/-. Full particulars can be had from the firm concerned.

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Punjab P. C. Fruit Development Board,
Punjab Agricultural College, LYALLPUR.

**RAJA SIR HARI KISHEN KAUL, REVENUE MINISTER, PATIALA,
VISITS GREWAL NURSERY BISHENPURA, RAILWAY
STATION CHAWAPAYAL, N.-W. R.**

Raja Sir Hari Kishan Kaul, Revenue Minister, Patiala, inspected Grewal Nursery, Bishenpura, Railway Station Chawapayal, N.-W. Ry. on 22nd Nov. 1939, Raja Sahib writes about the Nursery as under:—

I paid a visit to-day to the Grewal Nursery and Farm. I was delighted to see that the Farm was run on scientific lines and that S. Nahar Singh is taking a very keen interest in making it a model Farm for Fruit-culture. He has made a very extensive collection of fruit trees, both Indian and imported and what is most interesting is that he has distributed plants in lines consisting of each variety.....The arrangement of this orchards is very good indeed although he has not begun economising yet on the equilateral system of plantation. The arrangements for irrigation are copious. There are two wells each with two sets of Persian wheels and on one of these he has recently put a 6 H. P. engine with a centrifugal pump with 3 inch delivery. The total area of the farm is about 48 acres or so and two wells should give sufficient water for irrigation. He intends extending his Farm, but he will be faced with the difficulty of finding sufficient Farm manure unless he makes liberal use of artificial manure which however would raise the cost. He has just secured a truck for carrying manure to the farm from places outside the farm where he secures it by purchase.....I found everything neat and clean from the cultivation and shaping of fields and keeping of grounds to the watering arrangements. I think the Farm is one of which anyone can feel proud. I warmly congratulate S. Nahar Singh upon his enterprise and wish the Farm signal success as a commercial undertaking.

مالگم ہلک ریڈ ایک سالہ قد ۱ ۱/۲ فٹ سے ۲ فٹ تک چم آئے۔ مالگم ہلک ریڈ دو سالہ قد ۲ فٹ سے ۲ ۱/۲ فٹ قیمت ۸ آئے۔ مالگم ہلک ریڈ ۳ سالہ قد ۳ فٹ سے ۴ فٹ ۱۲ آئے گریپ فروٹ ۱۰ آئے۔ لیمن کاغذی ۳ آئے۔ دوسری ولایتی اقسام کے مالگم ۲ سالہ پودا جات ۱۲ آئے فی پودا۔ قیمت کے متعلق اگر فروٹ سپیشلسٹ صاحب سفارش کریں تو چوتھائی قیمت آرڈر کے ساتھ ۶ چم ریل اور پیکنگ وغیرہ کے لئے پیشگی باقی پودا جات پہنچنے پر اور اطامیان پہنچانے پر کہ کوئی پودا ضائع نہیں ہوا ایک ماہ بعد بھیجی جاسکتی ہے۔

Correspond please :—

**S. NAHAR SINGH,
MANAGING DIRECTOR,
GREWAL NURSERY, BISHENPURA.
Ry. Station CHAWAPAYAL (N.-W. R.)**

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The
PUNJAB FRUIT JOURNAL

Vol. IV]

Lyallpur, April, 1940

[No. 14

The 1940 Annual Number and The Present Issue

There has been considerable dislocation in commercial calculations due to breaking of the war. The prices have gone high. Especially the paper and other material for printing, etc., are being imported at a very heavy cost. It is no wonder, therefore, the cost of printing 'The Punjab Fruit Journal' has increased, very greatly.

Anyhow we mean to make our way. Despite the difficulties we have tried to persist in maintaining and consistently improving the standard of this magazine, which we believe, is the only authenticated journal of its kind in this country. The standard set by the 1940 Annual Number (January 1940 Issue) has won great appreciation throughout the country. All the research of the last decade and a half, made by the Fruit Section of the Punjab Agricultural Department—the biggest section of its kind in India—have been compiled in brief and popular language in one volume of 170 pages. This was verily, more than three times

the usual issue, with reading matter of genuine scientific value for years to come. The volume was so big that the Urdu translation of the same had to be published in a separate volume of more than two hundred pages.

This was all a sacrifice: for the motives of the Punjab Fruit Development Board, in publishing this journal, are non-profitteering. The Board means to bring about an intense awakening in the country, to foster the fruit industry on scientific lines, as it is being done in California, Palestine, Sicily, etc. These motives are based on the faith that both the national health and wealth will improve with the development of this industry.

Due to economic considerations already mentioned above, it was suggested at first, not to bring out the present issue. And the justification was enough, as the 1940 Annual Number was more than three times the normal number and the cost of publication had been unusually high. But the gap might have been awk-

ward. The present issue is published, therefore, but in a smaller volume, as compared with the usual issue, which fact, it is hoped, our indulgent readers would overlook. It is further hoped, they would not mind, if we claim from them an enthusiastic and devotional interest in the activities of the organization that is running all this show. The present issue is largely devoted to the proceedings of the last Annual meeting and speeches of distinguished personages.

The readers will be interested to read the speeches made by His Excellency Sir Henry Craik, the Governor, Punjab, and the Director of Agriculture, Punjab in the Annual Fruit Show held during the second week of January last; and those made by the Hon'ble Sir Sikan-der Hyat Khan, the Premier of the Punjab, Hon'ble Chaudhri Sir Shahab-ud-Din, Speaker, Punjab Assembly and President of the Board, the Annual Report read by Sardar Sahib Sardar Lal

Singh, the Honorary Secretary of the Board, in its Annual General meeting, held on 10th January, 1940, and the evidence of the Sardar Sahib, as Fruit Specialist to the Punjab Government, before the Unemployment Committee, regarding possibilities of the fruit industry in the province.

To give an idea, as to how the cause of the industry is faring in the Punjab Assembly, significant extracts from the speeches made by S. Hari Singh (Congress), Dewan Chaman Lal (Deputy Leader, Opposition) and S. B. Ujjal Singh Parliamentary Secretary, during the last year's budget session, are given in the shape of an article entitled "Discussions in the Punjab Assembly." It will be gratifying to note that the importance of the cause is recognized and supported both by the Government and the Opposition.

M. S. NIRMAL

RENEWAL OF MEMBERSHIP

"Ordinary" and "Regular" members of the Punjab Provincial Co-operative Fruit Development Board are requested that as their term for membership for 1939 has expired on 31st Dec., 1939 they should remit their renewal fees by Money Order. "Regular" members are required to remit Rupees six each while "Ordinary" members an amount of Rupees three only. "Life" members who have not completed the instalments of their life membership are also requested to do so now.

Progress made by Fruit Industry

His Excellency, the Governor presided over the Prize giving function of the Punjab Fruit Show on January 12, 1940. While giving away the prizes, His Excellency was pleased to remark :—

"When I first came to the Punjab, the fruit industry was practically entirely undeveloped. What little fruit was produced, such as mangoes, loquats, bananas and a certain amount of oranges, were I believe, entirely for local consumption, and the production of fruit on a commercial scale, even for consumption within the province, was practically confined to the lands surrounding our bigger towns. Export was almost, if not quite, unknown. As Mr. Stewart has remarked,* serious work on fruit growing began only some 13 years ago and the success that has been attained in that short period is really remarkable. Here we have practical proof of that success in an exhibition at which more than half the districts of the province are represented and to the prize fund of which sixteen District Boards

have, even in these hard times, contributed. I think this is an achievement on which the pioneers of the industry can look with pride and for which the Department of Agriculture, and more particularly its energetic and helpful Fruit Specialist, Sardar Lal Singh, deserve great credit.

"Progress during these 13 years has been rapid and, in spite of the somewhat pessimistic view taken by my Hon'ble friend, Chaudhri Sir Shahab-ud-Din, the other day, I venture to hope that the next decade will see an even more extensive development of the industry, that the enterprise of the Punjab cultivator will see the 70,000 acres now under fruit expand to at least double the figure and that Punjab fruit will find a profitable market not only in the great commercial cities of India, but in other parts of the world also."

*NOTE—The speech made by H. R. Stewart Esq., C.I.E., I.A.S., Director of Agriculture, Punjab, appears elsewhere in this issue.

("Tribune," Jan. 14, 1940.)

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گوچرانوالہ کے مشہور
سرخ مالٹا کے پودے

سنگتہ مالٹا کی قسم کے پودہ جات کی خرید کیلئے
محکمہ ہائے زراعت پنجاب اور شمال مغربی صوبہ سرحد سے
منظور شدہ اور پنجاب فروٹ نمائش میں اول درجہ و
دیگر انعامات حاصل کرنے والا سائنس کے اصولوں پر
قائم کردہ اور بڑے پیمانہ کا قابل اعتماد ذخیرہ (نرسری)۔
— تشریف لائیے اور ملاحظہ فرمائیے —
دیگر تفصیلات و نرخ نامہ مفت طلب کیجیے

دی پاپولر نرسریز و فروٹ فارم گوچرانوالہ پنجاہ

Winner of Several First Provincial Prizes

Genuine Blood Red Malta Plants are available for sale from the garden of BAKHSI KANHIYA LAL, Advocate and Municipal Commissioner, Gujranwala.

Nursery is approved by the Government.

پنجاب فوٹ لمانش میں نگی ایک اول انعام پانے والے مرغ مالہ کے پودے
بھشی کھنڈا لال اینڈریکٹ ہونسیل کمشنر کوٹوالوالہ کے باغ سے خریدے گئے ہیں۔
مالہ پھل کا ملاحظہ دیکھو و جنوری میں فرما سکتے ہیں۔

Please mention this Journal while replying.

BELIEVE IT OR NOT

1. PALESTINE with an area only about 1/7th of the Punjab and a population only 5% of the Punjab has about 150,000 acres under fruits. (ii) It exported in 1934 about 3 1/2 crore rupees worth of oranges alone to foreign countries.

2. ITALY, with an area and population of about 20% and 77% respectively more than that of the Punjab, has got 1.38 crore acres under fruits and mixed farms, and the garden produce constituted about Rs. 26 crore alone in 1932.

3. FRANCE with an area and population about 115% and 75% respectively more than that of the Punjab, had total production of wine amounting to 149 crore gallons in 1934.

4. EGYPT with a population of about half that of the Punjab earmarked an annual budget of over fourteen lacs of rupees for the development of its Horticultural Department.

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FRUIT DEVELOPMENT BOARD, LYALLPUR

Where Does Fruit Industry Stand Today?

Some striking observations were made by H. R. Stewart, Esquire, C.I.E., I.A.S., Director of Agriculture, Punjab, on the occasion of prize giving ceremony of the 1940 Fruit Show, held during the 2nd week of January. His Excellency, the Governor Punjab presided. In the course of his speech Mr. H. R. Stewart said :—

This Provincial Fruit Show, which was organised for the first time in 1928, has now become a firmly established annual event. It was one of the measures adopted for the encouragement of the fruit industry during the period when Your Excellency was intimately connected with the development of the Agricultural Department in your capacity as Financial Commissioner (Development). From small beginnings in a shamiana in the Lawrence Gardens it has grown steadily to its present dimensions when it fills the largest available hall in Lahore. Its objects are mainly threefold:—

(i) To make the high quality fruit, which the Punjab is capable of producing, better known to consumers and to the trade;

(ii) to bring the producer and the consumer into more intimate contact and so promote business;

(iii) to afford a suitable occasion when fruit growers and those interested in the fruit industry can meet to discuss their problems and arrive at solutions which are in their joint interests.

Owing to the time of the year at which this show is held the exhibits have to be confined to fruit of the citrus family, but within that group there is a very considerable number of varieties. The present show includes the finest examples in each case of malta of several classes, sangtras of two types, grape fruit, lemons, pome- loes, sweet limes and 'galgals'. The en- couragement of other classes of fruit is not neglected departmentally, however, for during the summer months divisional shows are held for mangoes at Jullundur and Karnal, and for mangoes and dates at Multan or Muzaffargarh. Two shows for cold region fruits, mainly apples and pears, have been held in Simla, but during each of the last two years the pro- posal to repeat these shows has had to be abandoned, at the last moment, owing to the impossibility of securing, on the re- quired dates, a suitable hall of sufficient size at a reasonable rent.

From the beginning, this Citrus Show has received the strongest possible measure of support from all interests connected with the fruit industry. Fruit growers send their products in increasing numbers each year. On the present oc-

casion 567 entries have been received from sixteen Districts. The North Western Railway carries the exhibits to and from the show at concession rates. The Lahore Municipality admits them free of octroi duty. Some public-spirited gentlemen provided the Challenge Cups for annual competition for the best exhibits both of fruit and fruit products. The attractive display of the larger exhibits indicates the keenness of the competition for these awards. In addition to the prizes which the Agricultural Department provides for provincial competition, District Boards, for some years past, have offered cash prizes for competition amongst exhibitors from within their respective boundaries. For the present show, sixteen District Boards have provided Rs. 675/- for this purpose. Lastly, officials and non-officials alike freely give their services in judging the exhibits, whilst the University provides the best possible setting for the Show in placing this large hall at our disposal. The increasing success and usefulness of the Show, year by year, is due mainly to the very generous co-operation and assistance which is received from all these sources.

Steps to Promote Fruit Industry

I should like now to review very briefly the steps which are being taken in this province to promote and encourage the fruit industry and to indicate the degree of success which has been attained so far.

Serious work on fruit, began only 13 years ago with the appointment of a Fruit Specialist. As time has gone on development has been rapid and the Fruit Section, of this Department, to-day is the largest and most progressive of its kind in India. In a number of directions other

provinces look to it for guidance and, not infrequently, it is an happy hunting ground from which other provinces recruit their staff.

As in the case of general farming, so in regard to the improvement of the fruit industry the Department's functions are three-fold. They are education, research and district extension work.

In the field of education the principal activities of the Department lie in the provision of a number of courses, most of them at Lyallpur, of varying duration designed to meet all needs. On the one hand they cater both for the mild interest of the wealthy land-owner who desires to have a few fruit trees in his garden as much for pleasure as for utility and for the practical farmer who wishes to engage in fruit farming as a means of livelihood, and on the other hand, both for the housewife, who wishes to learn how to prepare simple home-made fruit and vegetable products for family consumption, and the prospective manufacturer of fruit products on a commercial scale. These courses vary in length in the case of fruit growing from ten days to two years. The short courses deal with practical instruction in the selection of nursery plants and the initial layout of orchards, so that the main pitfalls, which cannot be rectified subsequently, and which often mean the economic failure of the orchard, may be avoided. They also include instruction in the subsequent care and maintenance of the garden. The long courses cater for the needs of fruit growers who hitherto have found difficulty in obtaining suitably trained orchard malis, as well as for youngmen of higher education, who desire to obtain a detailed knowledge of

fruit growing in all its aspects. For the farmer there is the one year's Malis' course which admits about twenty students annually, whilst for the latter, Horticulture has been accepted recently by the Punjab University as a subject for the post-graduate degree of M.Sc. (Agri.).

Courses in Fruit Preservation

In fruit preservation the courses are equally varied and range from the two weeks' short course intended for those interested in the subject only as a home industry, to the seven months' course designed for men who propose to engage in fruit preservation as a commercial industry. The popularity of these courses is enormous and applications for admission to them come from most parts of India. Short courses are not confined to Lyallpur. They were held last year in Lahore, Sheikhpura, Murree and Jullundur also. A feature of them is the demand for admission by ladies. At Lyallpur 51 ladies and at the other outside centres 120 ladies took these courses in 1939. We look forward to the day when fruit and vegetable preservation, for the home, will be introduced in all girl-schools in this province as is the case in America.

Research Work

Research in progress covers a very wide field and includes all important aspects of the fruit industry from the initial production of fruit nursery plants to the final marketing of the fresh fruit and the profitable conversion of surplus and culled fruit into products of various kinds. Experimental fruit gardens laid out about ten years ago are now providing valuable information as to the most suitable

varieties of fruit for the different parts of the province. As fruit trees do not reach maturity until five or six years after planting and as the Department's Fruit Section is still very young many of the field experiments have not yet reached a stage when final results are available. Nevertheless, data of considerable economic importance have been obtained already on the physiological, entomological, mycological, cultural and manurial treatments of fruit trees. Much research still remains to be undertaken before we are in a position to advise on many problems connected with fruit, such as the successful treatment of wither-tip and canker diseases or the optimum temperatures and duration for the cold storage of the different fruits. As to the disposal of surplus fruit and fruit of second quality, research has already produced a number of profitable products. Some of them obtained high praise when sent to a well-known firm of caterers in London.

District Extension Side

The services which the Department's Fruit Section renders on the district extension side are numerous. Beginning with propaganda directed to the expansion of the fruit industry in its various branches they include also advice and demonstration in all aspects of the subjects, such as the correct method of laying out and planting the orchard; the selection of the most suitable kinds of fruit trees, the actual supply of reliable fruit nursery plants; the arrangements to obtain the necessary enhanced irrigation water supply for orchards; the practical protection of orchards from pests and diseases by actual spraying and finally

assistance in the grading and marketing of fruit. Practical demonstrations are arranged and lectures are given at suitable conferences and on other public occasions. Fruit shows, such as the present one, are held. District Fruit Growers' Associations are organised and extensive assistance is given to the Punjab Provincial Co-operative Fruit Development Board. In short the help and guidance omit no phase of the fruit industry.

That this work is producing the desired result is apparent from the steady increase in the area under fruit in the province. With the co-operation of District Revenue Officers, it was ascertained in 1928 that the area of fruit, grown in recognised orchards was about 50,000 acres. Similar enquiries instituted in 1933 showed that the area had increased to 61,700 acres. The final results of the further census taken in 1938 are not yet available, but there is every reason to believe that the area will not be less than 68,000 acres. But though this progress is highly satisfactory, the total area under fruit still represents no more than 0.2% of the cultivated area of the province. Experience has shown that both the plains and hills of the Punjab are admirably adapted for fruit growing and there is still great scope for its development either as a subsidiary industry, capable of supplementing the income derived from ordinary cultivation by small holders or as the principal crop of those who possess the capital and land necessary to take it up on a large commercial scale. Progress on the fruit preservation side is also satisfactory, in that several capitalists, attracted by the possibilities which this industry offers, have invested

considerable sums in erecting and equipping factories which are now manufacturing products on a commercial scale.

Punjab Fruit Development Board

In its efforts to develop a sound fruit industry in the province the Department receives valuable support from the Punjab Provincial Co-operative Fruit Development Board. One of this Board's most valuable contributions hitherto is its quarterly Fruit Journal which is supplying a need much felt by fruit growers. Recently the Board has undertaken another most important measure in the form of a survey to locate, throughout the province, fruit trees of outstanding merit, with a view to the subsequent utilization of budwood from those trees for nursery purposes. The Department is experiencing difficulty in obtaining an adequate supply of good budwood for its fruit nursery work. The 39,000 fruit nursery plants which the Department supplied last year and the 50,000 which it hopes to have ready for sale in the coming year represents only a fraction of the demand. By locating fruit trees which have given an outstanding performance and from which the Board itself and the Department can purchase budwood for nursery requirements, the Fruit Development Board is performing a service of the greatest possible value to future fruit growers in ensuring the quality and merits of the nursery stock available for them.

Such, Your Excellency, is a brief account of the lines on which the fruit industry is being developed, of the progress which is being made and of the part which the Department is playing in it. Much has been accomplished in the

relatively short time during which special attention has been given to it, but much more can still be done. With the interest which is being taken in the industry, both by Government and by private en-

terprise, there is every reason to feel that, before very long, fruit growing and its allied industries will make their recognised contribution to the prosperity of the cultivator and the industrialist alike.

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The price of box varies according to distance. But now each box is valued at Rs. 2/8/- free on delivery at any station on N. W. Railway in the Punjab. Payment must be made in advance with despatching instructions by money-order or postal order.

The mango season lasts for a short time for each variety commencing from May. It will facilitate matters if orders are booked earlier. All remittances and communication should be made to :—

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P. O. CHAPAI-NAWABGUNJ, (Malda).

Branch :— P. O. KATRASHGARH, (MANBHUM).

(Please mention this Journal while replying.)

To Subscribers of the Punjab Fruit Journal

Most of the subscribers of the Punjab Fruit Journal started subscribing to the journal from July 1939. With the supply of this issue their annual subscription expires. They are requested to remit Rupees three by return to renew their subscriptions during this quarter, failing which the next issue of the journal will be sent per V. P. P. of Rs. 3/8/-

Presidential Address

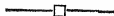
OF THE

Hon'ble Chaudhari Sir Shahab-ud-Din,

President, Punjab Fruit Development Board.

Delivered at the Annual General Meeting of the Board,

Held at Town Hall, Lahore, on January 10, 1940.



The Hon'ble Major Nawab

Sir Sikandar Hyat Khan & Gentlemen,

I have great pleasure in thanking you, Sir, for the great honour you have done us in presiding over this annual meeting of the Punjab Fruit Development Board and thus giving us an opportunity to place before you our grievances as fruit growers of the Province.

We have been and still are of the opinion that there are great possibilities for the development of the fruit industry in the Punjab. Nature is unusually bountiful to us. It has allotted to us an exceptionally fertile soil, extending over a vast area, with varieties of climate, from the coolest of the hilly regions to the hottest of the dry tracts. Besides, it has provided us the biggest irrigation system in the world, with abundant cheap labour and many other facilities. There can be no two opinions that next to agriculture, horticulture is the best industry which the Zamindars of the Punjab can

and should profitably take up. If this industry is properly developed, it is bound to contribute immensely, not only to the wealth but also to the health of the province. It will not only enrich the rural and urban people, but shall also swell the exchequer of the province and solve to a great extent the difficult problem of unemployment, as has been rightly emphasised by the Punjab Unemployment Committee only recently.

I am further of the opinion that, with the encouragement, co-operation and patronage of the Government, the development of this industry is bound to give an impetus to various allied industries, such as, fruit preservation, juice industry, cold storage, citric acid, essential oils and numerous other by-products. It will also open a new vista of possibilities for employing thousands of educated young men as fruit farm managers,

chemists, canners and clerks. The heartening success of the Punjab Government experiment in granting squares of land for ordinary agriculture to a selected number of graduates, has convinced me that a net work of similar grants for fruit gardening can be advantageously spread all over the Province, especially in the canal irrigated areas. I am certain that gardening operations, such as, the budding of plants, spraying, pruning and training of trees and the preserving and marketing of fruits shall open for them vast fields for working on scientific and economic lines, which require more intelligence but less manual labour than the cultivation of general farm crops.

In my last presidential address, I stated briefly what tremendous efforts, the governments of other civilised countries, for example, Italy, France and Palestine, are making to foster fruit industry. Special legislations are passed, ordinances are issued and concessions are granted, e.g., remission of land revenue for garden areas for a number of years, free supply of genuine and healthy plants, and liberal subsidies on the manufacture and export of fruits, etc. Huge sums are provided in annual budgets for horticultural departments. Even Egypt spends about fifteen lacs of rupees a year on its department of horticulture. It is clear, therefore, that fruit industry cannot flourish in any country without the patronage of the Government. In countries, which enjoy state patronage, the development of the industry is simply remarkable. Of the total estimated world orange production of 251,784,000 boxes, even the small countries, like California, Spain and Brazil account for $3\frac{1}{2}$ crores of boxes each.

Countries nearer home, like China, Japan, contribute about one and a half crore of boxes each. California has 331,216 acres under citrus fruit alone. In 1937, its Citrus Growers' Exchange (an inspiring model for the Punjab Fruit Development Board) with a membership of over 14,000, spent about rupees forty lacs on advertisement alone; and it is estimated that this exchange has spent so far over rupees seven crores on popularising the citrus fruit of California under "Sunkist" brand. Palestine, a country, with a population not more than that of the Lahore District, exported twenty lac boxes of fruits in 1928; but it increased its export in 1937 to one crore and ten lac boxes. Every possible effort is being made to push the sale of Jaffa oranges and grape-fruits throughout the world. For this purpose a special advertising tax is levied on all citrus exports and in 1938 over rupees five lacs were spent. The Union of South Africa, which in 1916 exported only 65,865 cases of oranges, exported $27\frac{1}{2}$ lac cases in 1936. Nearly 80% of the South African Citrus export is organised through South African Co-operative Citrus Exchange, which is financed by a substantial levy imposed by law on citrus export of the country. But our province, a land of old civilization and rich with horticultural possibilities, has, to our great disappointment, no place on the map of the world fruit production, for want of state patronage. However, I have every hope that the instances given above, will awaken our Government to its responsibilities and that it will lose no time to extend its patronage to the Punjab Fruit Development Board, which was organised some 4 years ago to build a

progressive national fruit industry in the Punjab on the basis of the inspiring international background.

Four hundred leading men of the Punjab, representing all castes and communities, rallied round the banner of the Board and became very enthusiastic supporters of its aims and objects. They were so zealous that, within a short period, the Board succeeded in organising about a dozen and a half local fruit growers' associations in the province. The Executive of the Board, consisting of leading fruit growers, important businessmen, retired Government officials, M. L. As., Judges and others, all well-versed in various walks of life, started work with great earnestness and appointed the following six Standing Committees :

- (1) The Fruit Journal Standing Committee;
- (2) The Bud Selection Standing Committee;
- (3) The Marketing Standing Committee;
- (4) The Irrigation and Revenue Standing Committee;
- (5) The Assembly Members Fruit Group; and
- (6) The Fruit Preservation Standing Committee.

All these Committees were formed in the hope, nay expectation, that with their able and efficient personnels, they will achieve remarkable success and before long transform 'the land of the five rivers' into one of the best fruit growing countries in the world. But I must confess that the work so far done and progress so far made have hopelessly fallen short of public expectations, in spite of

the fact that the Committees have spared no efforts to push the cause of fruit industry with all possible speed. Difficulties and obstacles, particularly of the lack of funds and paucity of water supply, have been so great that unless the Government comes forward to help the industry with a settled policy and a firm determination, the Board and its Standing Committees cannot possibly succeed in achieving their important objects. The members of the executive and standing committees have been regularly attending their meetings at a considerable sacrifice of time and money, without receiving, of course, any allowance, honorarium or remuneration; and though they have not achieved what they desired and hoped to achieve, yet they have created such an awakening that if the Government comes forward to complete what has been so well begun, the Punjab shall, before long, give a lead in fruit growing to the whole of India, as it has already done in several other directions.

Now I will review briefly the work so far done by the various Committees.

The Punjab Fruit Journal Standing Committee.—A bi-lingual quarterly organ of the Board, the Punjab Fruit Journal, started in January, 1937, has proved a very successful venture. Up till now 13 issues of this periodical, including four special numbers, have seen the light of the day. The latest special number of the Journal, a copy of which, Sir, I have the honour and pleasure to present to you now, speaks for the high standard it has attained. The venture, I am glad to say, has received a very encouraging response from the Agricultural Departments of sister provinces, neighbouring States, the press and the public.

It is remarkable that the Journal has not been only supporting itself from its very start; but that it has added to the income of the Board a substantial sum of Rs. 2,073|15|9, up to the end of July, 1939. During this short spell of its existence the Journal has attracted over 500 subscribers, other than the members of the Board, from all parts of India.

I take this opportunity of expressing my high appreciation of the editorial work, done, with commendable keenness, by its Chief Editor, the Fruit Specialist, Punjab, and his assistants. I must also acknowledge the valuable assistance given by the Government Entomologist and Mycologist, who have been contributing very useful articles to the Journal.

Besides this periodical, the Board has, for the benefit of all concerned, published bulletins on the fruit industries of Egypt, Palestine, Italy and Sicily, France and Switzerland and Kashmir, based on the observations made by the Chief Editor, Sardar Sahib Sardar Lal Singh, during his tour of those countries.

The Irrigation and Revenue Standing Committee.—The scope and functions of this Committee are wide, diverse and important. Its responsibilities are manifold. It has to get redressed by the Government, the grievances of the fruit growers in respect of (i) supply of water for gardens (ii) unjust levy of Abiana, revenue and Malkana, etc., on garden areas and (iii) denial of the grant of Kharaba concession in case of failure of fruit crops. But it is extremely regrettable that its representations, in regard of these matters, have so far met with unexpected indifference on the part of the Canal and Revenue authorities,

who have not realised the set-back, this paying and progressive industry has received in canal irrigated areas as a result of their policy. The fruit growers in the canal colonies have unfortunately to depend entirely on canal water, as well-irrigation is not possible in almost all canal areas owing to the saline nature of the sub-soil water. So, unless the Government gives the matter its sympathetic consideration, any further improvement and development of the industry in such areas is impossible.

Prior to the inception of the fruit section of the Agricultural Department, some 12 years ago, the treble wari system was in vogue for the development of gardens. But for reasons, best known to the Government, this concession was withdrawn, the moment the Agricultural Department undertook to foster the fruit industry. This drastic change was so resented by fruit-growers that they made numerous representations, all of which, however, failed to move the gods of water.

The Under Secretary, Irrigation Department, in his D. O. letter No. 34|S Rev. dated 16-6-37, to the Honorary Secretary of the Board, conveyed the Irrigation Department's decision to supply double quantity of water for gardens to those applicants who had applied for it before 15th September 1936; but this undertaking also remains unredeemed up to this day.

Our written representations having proved ineffective, we resorted to organise a strong deputation of the members of the Board to wait upon the Hon'ble Minister for Revenue, who with his Chief Engineers, was pleased to grant an inter-

view to the deputation on 17th March, 1939. After a good deal of discussion it was decided to give double supply of water to gardens in the canal colonies, so long as (i) the area under fruit did not exceed half per cent of the total commanded culturable area on any one canal or 2% on a distributory; and (ii) gardens were planted and maintained to the satisfaction of the Agricultural Department.

In view of the above decision, we expected to get at least a double supply of water as soon as our applications were examined and forwarded to the Irrigation authorities by the Agricultural Department. But I regret to say, Sir, that so far not a single applicant has been given what the deputation was promised ten months ago. These factors go a long way to justify the general impression that the Canal Authorities do not mean to keep their undertaking or that they are deliberately delaying to give effect to it, to the utter disappointment and resentment of the fruit growers.

Another grievance of the fruit growers in the canal colonies, is the bi-yearly assessment not only of 'Abiana,' but also of revenue and 'Malkana' on fruit areas which give only one harvest and not two in a year. However, this is not all. Even the well established concession of 'Kharaba,' is denied although a fruit crop may be a total failure. The canal authorities are fully conscious of this atrocious injustice but they do not care to right the wrong. It is clear from what has been stated above that the Irrigation Department has treated the fruit growers so shabbily that they have every justification to question the seriousness of undertakings given and promise made

to them by the Department. This, I am afraid, might shake the faith of the fruit growers in the good intentions of the officers of the Government. So, I strongly urge upon you, Sir, to intervene immediately and stop the growth of mistrust and uneasiness in the minds of fruit growing community.

Bud Selection Standing Committee.—

Although most of the fruit trees in old gardens are of very inferior quality, yet there are a number of trees, scattered in various gardens throughout the province, which bear heavy crops of good quality. These trees afford conclusive evidence of the extent to which the fruit industry can be revolutioned, if these selected trees were used for propagation of Nursery plants. It was in April 1937 that the Committee drafted a scheme to achieve this laudable object and volunteered to initiate it under the able guidance of the Agricultural Department with a sporting offer to bear 50% of the cost of its working. But the proposal met with cold reception. Later on, the Board again took up the matter with the Government and suggested that funds, necessary for the working of the scheme, could be provided for from the Rural Development Fund created in 1938; but on this occasion also their representation failed to receive a favourable consideration. However, the Board, realizing the good that would result from the successful operation of the scheme, could no longer hold the project in abeyance. And you will be glad to know, Sir, that the Board, in spite of very meagre funds at its disposal depending solely on the support and co-operation of the fruit growers, has recently launched the scheme. To start with, its monthly ex-

penditure is something like Rs. 500|- but it is bound to go up before long, to Rs. 700|- per mensem. If (God forbid) despite our best efforts this useful scheme meets with an adverse fate, I venture to say that the responsibility for its failure shall be on the Government, which, in spite of our repeated requests, have refused to give financial help. I strongly feel that this work should have been taken in hand by the Agricultural Department when the Fruit Section was opened some 13 years ago. But this was not done. However, I hope that, the Government will be well advised not to lose any more time and support the Board in this laudable work by subsidising the scheme with, at least Rs. 10,000|- out of the Rural Development Fund.

Marketing Standing Committee.—

This committee held a large number of meetings and, after discussing the marketing question in all its aspects, unanimously decided to establish a fruit market at Lahore, where fruits produced by members and others, could be sold under hygienic and sanitary conditions. This scheme, if given effect to, would have met with a great success, as not only the Punjab fruit growers, but also the fruit growers associations of Nagpur and U. P. had assured their full co-operation. The only favour the Board asked in this connection was the grant of a suitable site. A deputation of the Board waited on you, and other honourable members of your Cabinet, on 1st July, 1937, and, Sir, you were pleased to promise, on behalf of the Government, that a free lease of the Nazul plot outside Shahalmi Gate, Lahore, would be given to the Board. Feeling certain that the plot will be

given, as promised, the Board worked out an elaborate scheme for the efficient running of the proposed market and went so far as to engage the services of a well-qualified young man, who was given the necessary training and made to visit all important garden localities in the province. Even a design of the proposed market was submitted by the Board to the Local Government; but it is a pity that the red tapism stood in the way and all that we have got at present is only a big file on the subject.

Sir, on 19th April, 1939, when a deputation of the Board again waited on you, you were pleased to promise your whole hearted support to the scheme and reassured the Deputation that the Board would be allowed to proceed with the marketing scheme at the site asked for, but apparently, owing to your multifarious duties and pre-occupations, you could not give effect to your sympathetic undertaking and to-day we are where we were three years ago.

Now we understand that the Administrator, Lahore Municipality, intends to have a Municipal Fruit Market. We wish him success; but are extremely doubtful whether the scheme will materialise for years to come, as every one is aware that the scheme, though under consideration for quarter of a century, has failed to achieve a tangible shape.

Sir, I may state *en passant*, that it appears to be highly expedient that fruits and vegetables in order to ensure better marketing conditions should be declared agricultural produce, under the Punjab Agricultural Produce Market Act, 1939.

"Assembly Fruit Group."—The members of the Assembly Fruit Group, par-

ticularly Sardar Bahadur Sardar Ujjal Singh and Diwan Chaman Lal, voiced the feelings of the fruit growing community in the course of a general discussion on the Last Annual Budget. And had the ballot box favoured them, the grievances and difficulties of fruit growers would have been sufficiently ventilated on the floor of the Legislative Assembly by the discussion of a resolution on the subject of which notice had been given by a large number of members. Subsequently no less than 60 members, mostly belonging to the Government party, submitted a signed memorandum to the Government; and Dr. Gopi Chand Bhargava, the Leader of the Opposition, issued a press statement requesting the Government to foster this important industry in every possible way. But I regret to say that up to this day all entreaties and appeals have failed to bring any favourable response and the general feeling is that the public opinion is being flouted.

Sir, on some important points, connected, directly or indirectly, with the fruit industry, I have a lot more to say; but I don't wish to bother you any more. Allow me, however, to say that every word, said by me to-day, has been said as the mouthpiece and representative of the Punjab Fruit Development Board, all members of which are most anxious to see the fruit industry flourish as early as possible. We entreat you, therefore, most earnestly, to consider our grievances as sympathetically and favourably as you possibly can. I am conscious, Sir, of the fact that I have spoken to-day rather plainly, but my justification for doing so is the unfair treatment, the Board has hitherto received. To be more frank, we have become extremely disappointed and dejected and have begun to feel that unless you and your good Government consider our grievances very fav-

ourably, the much-desired development of the fruit industry in the Punjab is doomed.

Before I sit down, I must express my sincerest gratitude to His Excellency the Governor, the Patron of the Board; the Honourable Rao Bahadur Chaudhri Sir Chhotu Ram, Minister for Development, the Vice-Patron; and the Financial Commissioner, Development. I have also to thank Mr. Stewart, the Director of Agriculture for the very keen, sympathetic and helpful interest, he has been taking in promoting the various activities of the Board. We also owe a debt of gratitude to the members of the Managing Committee and the Standing Committees, who have been giving most ungrudgingly their valuable time for attending the meetings of the Committees and participating in their deliberations, without receiving, of course, any honorarium or travelling allowance, etc.

The Board, I am glad to say, is very lucky in having Sardar Sahib Sardar Lal Singh as its Honorary Secretary. He is a very capable, energetic, hardworking and amiable officer; and I think, I am voicing the feelings of all the Punjab fruit growers, when I say that every one of us is grateful to him for all that he is doing so efficiently to foster fruit industry in the Punjab, and feels proud of his achievements in this field.

Sir, before resuming my seat I once more wish to convey, on behalf of the entire fruit growing community of the province, our deep gratitude for the great honour you have done us by presiding over this session of the Board. I further venture to appeal once more to your sincere patriotism, profound statesmanship and administrative responsibility to immortalise yourself by placing once for all on a strong and permanent footing; the fruit industry in the Punjab.

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But the Government has Difficulties—

The Hon'ble Premier, Sir Sikander Hyat Khan, while delivering his Annual Address in the 1940 Annual General Meeting of the Fruit Development Board congratulated the Board for the headway it had made. But the burden of his address was that the Government has difficulties in meeting the many demands of the Board. In the course of his speech he said :—

The Hon'ble Chaudhri Sir Shahab-ud-Din and Gentlemen,

I consider it a great privilege to have been asked to attend this function to-day and to preside over it. You have rightly referred to the great opportunities for development of fruit industry in this province, both from the climatic point of view and the facilities offered by our vast irrigation system which is the largest in the world. But, so far as irrigation facilities from our canals are concerned I am afraid, Sir, your Board came into existence somewhat late to derive full benefit from it. That does not mean that I am not in sympathy with the objects of your Board. The success of the fruit industry in this province will be judged, not merely by the quality of fruit you produce, or the additional wealth which it would put into the pockets of the members of your Association, but from the fact that fruit is made available to the poorest and the humblest citizen in the province. I am glad to say, and I believe you will agree with me, that fruit is now available in the villages where formerly the villagers never even saw an orange, much less other fruit. But now the fruit is grown on a large scale in the province and even in remote villages. This is all to the

good. I congratulate you and your Association on the headway which you have been able to make and the great progress which the fruit industry has made in this province. The office bearers of your association in particular deserve to be congratulated on the great skill and zeal they have shown in the matter of publicity and propaganda. I am confident that you will go on from success if you proceed as you have hitherto done. But I may be permitted to say that for the development of this, or for that matter of any other industry, the peculiar conditions and economic fabric of this province must be constantly and prominently kept in view. In making your plans for further progress you must keep in view those conditions which make it imperative that the interests of the smaller man must not be overlooked. You have, in your address said some hard things about Government departments. I hope you will forgive me if I am equally frank although I will not be equally harsh. You have said some hard things about some Government Departments and have even said that the treatment that you have received from them is unfair. The Government are pressed on all sides for assistance to this or that worthy object,

and it is a case of "what is fairplay when there is not enough to go round." And in some cases there are technical difficulties of great complexity which hinder an apparently simple request. You have, for instance, stated, with what I consider to be an unfortunate juxtaposition that the "treblewari" system was withdrawn, for reasons best known to Government, the moment the Agricultural Department undertook to foster the fruit industry; thus implying that the left hand of Government did not know what the right hand was doing. The fact is, and it must be known to others besides Government, that the Irrigation Branch found it impossible, for lack of water supplies, to contemplate any considerable extension of gardens to which the "treblewari" system would have given about three times the amount of water given to ordinary lands. After much discussion it was decided that an extra allowance of water must be given to fruit growers if they are to succeed in their enterprise. There is no extra water available and the water must therefore come out of the existing pool, that is to say, that the water now distributed to zamindars as a whole must be slightly reduced. It was thought that this could be done without serious hardship by reduction of $\frac{1}{2}$ per cent. on any one canal. This would mean that orchards to the extent of $\frac{1}{2}$ per cent. of the Culturable Commanded Area would be permissible on any one canal. And subject to the total of the canal not being exceeded, it was thought that orchards could be permitted to the extent of 2 per cent. of the Culturable Commanded Area of any one distributary. The proposal has not yet been sanctioned but I

understand a recommendation on the point is being made by the Irrigation Department and you may rest assured that it will receive sympathetic consideration of the Government. (Hear, hear).

It was intended that the benefit of this concession should be given both to the man who grows fruit on substantial scale and to the small zamindar, who might wish to grow fruit in half a killa or even in a smaller area. The difficulty in helping the small man lies in the inability to adjust outlets so finely as to give extra water from the distributary to small gardens. The finest adjustments that can be made would give extra water to a square. This is far beyond the needs of a small man and cuts out the possibility of giving him water from the distributary. The only way he can be given water is by revision of *warabandi*, that is to say, he will be given the water he requires at the expense of his immediate neighbours and this will be greatly resented by those neighbours. This is an illustration of the difficulties involved, especially in the case of helping the small man, whose interests, as you are aware, Government are particularly keen to foster. I hope you will not mind if I warn you that the way things are developing, you will be well advised, in your own interest, not to alienate the sympathy of the smaller man. As regards your complaints in the matter of *abiana* and the restriction of the concession of *kharaba*, the whole question was examined by the Canal Act Committee, which was recently appointed. Their recommendations have been received and your point of view will be kept in view in taking a decision on those

recommendations. The recommendations are under consideration.

From your point of view it is immaterial whether the amount is collected in two instalments or one. What matters from your point of view is the rate at which abiana is levied, and that would receive sympathetic consideration.

Turning now to your criticism of another department, I refer to the cold reception which you say was accorded to your scheme to secure that specially prolific trees or trees of specially good qualities should be propagated. Government had approved administratively a scheme covering a period of two years at a total cost of Rs. 13,270/-. Owing to prevailing financial conditions it has not been possible to provide these funds, nor even has it been possible to accept a suggestion of the Director of Agriculture that the annual grant-in-aid of Rs. 2,500/- made to your Board should be increased to a minimum of Rs. 4,000/- per Annum and preferably to Rs. 5,000/-. Nevertheless, in spite of the acute financial stringency and drastic cuts in expenditure in all departments in the ensuing financial year, Government's contribution to your Board has not been reduced and is still Rs. 2,500/- so that Government have not entirely neglected you. You will, I am sure, agree with me that famine-stricken people have a prior claim on Government than the amelioration of the lot of affluent fruit growers.

I have the greatest sympathy with your efforts to establish a proper hygienic market for fruit in Lahore and I am sorry indeed that your efforts have met with no success, so far, through no fault of your own. I suggest that you might

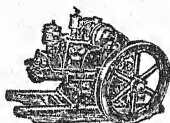
approach the Ministers concerned, that is my colleagues sitting on my left and right, and I am sure they will be able to do something in the matter and find a way out of the difficulty.

Finally, you have referred in passing to the need to declare fruits and vegetables to be agricultural produce under the Punjab Agricultural Produce Markets Act, 1939. This question has not so far been examined, but it will receive every consideration when action is taken to apply the provisions of the Act, and there is nothing to prevent fruits and vegetables being brought under the Act whenever it is considered desirable.

Before I conclude, I might venture to make one or two constructive suggestions which may enable you to get over the difficulty of irrigation to which reference has already been made. One is that you may consider the advisability of putting tube wells where additional canal water cannot be made available. In that connection perhaps you may like to approach Government, if you are satisfied that it is possible to replace canal supply by tube wells, and ask Government to give help by way of taqavi loan. The other matter, to which I think you should give very careful consideration is that you must make every endeavour to satisfy and help the smaller man. As I have pointed out it is very difficult to provide additional water under the existing arrangements. I would suggest that your board may carefully and sympathetically consider the proposal of devising some kind of co-operative system whereby small owners could pool their resources and set apart one square in each village and then share in the profit. That is a

proposal which, if it is found to be practicable, might enable you to get over your difficulties. It will help the smaller man and ensure his sympathy for your organisation.

I thank you once again for the welcome extended to me and I am very grateful for giving me an opportunity of meeting you all and addressing you. thank you again (Applause).



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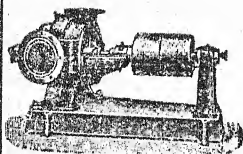
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LYALLPUR.**

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Findings of the Unemployment Committee

[Below are reproduced extracts from the report of the Committee in relation to the fruit industry. The Committee, presided over by the Hon'ble R. B. Sir Chhotu Ram, Minister for Development, expressed thorough satisfaction with the progress and great optimism for the future of the Fruit Industry in the Province.—Ed.]

Fruit farming.—The latest annual report of the Department of Agriculture dealing with fruit states:—"No section of the Department has grown so rapidly in recent years as that which is devoted to the development of fruit growing and fruit preservation." With all this development the total area under fruit gardens in the Punjab is under 70,000 acres. Sardar Sahib Sardar Lal Singh, Fruit Specialist of the Department, furnished some interesting statistics to compare conditions in the Punjab with some foreign countries. Egypt with only half the population of the Punjab is now spending almost Rs. 14 lakhs per year on its horticultural activities. Experimental and demonstration gardens covering several thousand acres are being established and lakhs of nursery plants are being supplied, free of cost, to the public. Palestine, with a population of about five per cent. of the Punjab, exports annually several crore rupees worth of oranges alone. Its citrus area has increased 800 per cent. within a short period of eleven years. In the Punjab there is one acre of fruit garden, and that also in a wretched condition, for every 400 men. In Palestine, there is one acre

of excellent garden for every 7 men. California, with only about one-fourth population of the Punjab, has about 20 lakhs of acres (two millions) under fruits which means an acre for every 3 men approximately. For every thousand acres of cultivated area California has about 250 acres under fruit gardens against two acres in the Punjab. Italy with a population of only about 75 per cent. more than that of the Punjab has over 17 million acres under fruits. France a country of small holdings and with a population of about 77 per cent. more than that of the Punjab has 3½ million acres under grapes alone.

Favourable Climatic Conditions

According to our Fruit Specialist, the Punjab has a variety of climate which is favourable for growing every kind of fruit. In places like the Kulu Valley we can and do grow, almost to perfection, cold region fruits like apples, pears, cherries, persimmons, walnuts, etc. In the sub-mountain tracts we can grow fruits preferring more moderate climate like peaches, plums, apricots, almonds, loquats, etc. In the plains, canal colonies are particularly suitable for growing

fruit of the citrus variety as also mangoes and guavas. Lastly, in the hot and dry districts in the south-western Punjab we can grow excellent dates. In a province having favourable conditions of climate, soil, irrigation and a hardy peasantry it is a matter for regret that we have not made more progress than we have.

Public Interest Stimulated

But there is cause for some satisfaction that we are now making rapid progress and public interest has been greatly stimulated by holding fruit shows, by formation of district fruit growers' associations and the Provincial Co-operative Fruit Development Board, by giving addresses at meetings of various sorts and by production and supply of reliable fruit nursery plants on a large scale. In the past the Department has produced a relatively small number of nursery plants in comparison with the demand but about three years ago money was provided from the Rural Reconstruction grant made by the Government of India for the extension of existing nurseries and opening of new ones. In the coming year the Department will be able to supply half a lakh of fruit nursery plants and it is hoped to increase this production very considerably in the coming years. Even so the demand for reliable plants is far in excess of the supply. In his evidence before us Mr. Stewart (Director of Agriculture, Punjab) hesitated to say that the Department is at present supplying even one-fourth of the demand; this in spite of the fact that the department's plants (citrus) cost five annas each. In the absence of a greater supply people buy cheap Saharanpur plants of unreliable origin at three annas

a plant. We view this position with anxiety because a mistake made in laying a garden with plants of doubtful origin and of inferior quality cannot be rectified for almost a generation. Disappointing results are bound to act as a brake on the newly created and growing enthusiasm for fruit gardens. We understand that the Department has recently put down a progeny garden of 25 acres at Risalewala near Lyallpur for the production, on a large scale, of budwood of the several good varieties of citrus fruits. We are of opinion that this is not enough. The Department should take steps to increase the supply of nursery plants very considerably over the present level and we strongly recommend that the price of plants should be reduced to about two annas per plant if indeed the supply cannot be made free. Free supply will be a kind of subsidy to the fruit industry. We feel that the importance of the industry, justifies that action.

Satisfactory Progress in Research Work

So far as research work on fruit is concerned, we note with satisfaction that experimental gardens have been laid down at Montgomery and Attari (Amritsar district) " Research work on grapes, phalsa, ber trees, maltas, grape-fruit, plums, etc., as detailed in the latest annual report of the department shows satisfactory progress.

If the present progress is maintained, in a few years the production of fruit will be doubled and even trebled over its present level. We wish to strike a note of caution against too rapid progress without taking note of marketing conditions. There is reason to think that even with the present limited area under

fruit a year of good crop means uneconomic prices. One of the principal matters under the consideration of the Punjab Provincial Co-operative Fruit Development Board is the establishment of a properly run whole-sale fruit market at Lahore. The existing market is most unsatisfactory in many respects and the Board feels that the establishment of a properly run market at Lahore is of fundamental importance to the fruit growers of the province. We understand that negotiations are proceeding at present between the Government and the Board for a site. We recommend that every facility should be given to the Board, so that the market may be established in the very near future. Here we would also like to note the difficulties of transport for marketing fruit grown in the Kulu Valley and Kotgarh areas. The matter requires sympathetic and early consideration.

Fruits Preserved in Excellent Quality

Fruit growing by itself will not pay unless simultaneously we develop the fruit preservation industry. We observe, from the report of the department, that recently Government have erected and equipped a canning hall at Lyallpur where experiments on fruit preservation can be carried out on a semi-commercial scale and where instruction can be given to those who desire to take up fruit preservation as a business. Government have also erected a small cold storage plant at Lyallpur. We understand from the Fruit Specialist that the orange and lemon squashes produced at Lyallpur compare very favourably with foreign squashes. Apart from squashes, tomato ketchup, tomato juice, mango chutney, pear jam,

etc., of excellent quality have been produced. These articles have been prepared at well below the cost of imported articles of the same quality. Arrangements have been completed with a firm of repute to sell these products.

According to the Fruit Specialist, the greatest scope on commercial lines lies in the manufacture of fruit juices. The Punjab is a hot province and the need for cold drinks is felt for the greater part of the year. The aerated waters now sold in the market contain artificial colour, flavour and saccharine, none of which have any food value. If fruit juices could be substituted for these synthetic preparations it will mean good health for the consumer and prosperity for the fruit grower. There does not appear to be any justification for importing orange or lemon squashes or other fruit juices from abroad when very large quantities of fruit are available here and these juices can be prepared at a cost well below the price of the imported product. The Fruit Specialist is of opinion that in ten years' time 30 to 40 lakh bottles of squashes should be produced in the Punjab every year.

Side by side with fruit preservation we should also develop vegetable preservation. At certain seasons in the year tomato and green peas are very cheap in the Punjab. In fact, the province is so favoured by nature that none of these products—fruits and vegetables—should be allowed to go to waste. Even common fruits like peaches, plums, guavas, apricots, dates of very poor quality could be used for manufacture of jams, jellies and vinegar etc. We are told by the Fruit Specialist that the cost of making

vinegar from some of these fruit does not come to even one anna or so per bottle.

We Are Optimistic

We are optimistic about the prospects of the fruit industry The district work of advice and propaganda is carried out by the ordinary field staff of the Agricultural Department. Lectures on fruit, form part of the syllabus for the degree course at the Agricultural College. Young men passing out from here, on appointment as Agricultural Assistants, are equipped for their work in this branch. Older Agricultural Assistants, are being given short courses at the College. In view of the growing importance of the industry we doubt if this is enough. The Fruit Specialist advocates the establishment of a separate department of horticulture. He said:—"I do feel that if there were a Director of Horticulture with the necessary staff under him, i.e., a self-contained unit of organisation, he would be in a better position to deal with the subject than he (Fruit Specialist) can do at present. There is not, however, much in the name. What is needed is an adequate staff for advisory work." In the course of his evidence Mr. Stewart, the Director, was asked whether he was quite satisfied that whatever work on horticulture is being done at present or is likely to be done in the near future can be tackled by the present staff. He replied:—"More staff is necessary in the line of research. We have extended our activities greatly and I think, there is no other province in India, which is giving as much attention to it, as we do here. Field staff is totally inadequate." Mr. Stewart would, however, give this work

as part of duty to the ordinary Agricultural Assistants. On this point Sardar Lal Singh's opinion may be quoted. "I may mention that we have already got district staff of the Agricultural Department. Agricultural Assistants are supposed to give advice on various aspects of agriculture, including horticulture. My view is that they know little of horticulture and are not of very great help to fruit growers. In order to overcome this difficulty to some extent we have started at Lyallpur a special course of six months in which we get one man from each of the seven Agricultural Circles in the province. After getting this short training these men may be in a position to give advice but the experience of other countries like California and Egypt shows that one man cannot do full justice to both agriculture and horticulture as there is very little in common between these two branches. Each branch must have a separate staff. I do not necessarily insist on a separate department of horticulture. For the present the Fruit Specialist, as such, may have a separate district staff of his own. To start with, there may be an horticultural assistant for say, every two or three districts."

The Advisory Aspect

In view of the fact that fruit gardening is a long term investment and a very important industry we wish to lay great stress on the advisory aspect. Right advice and at the right time is essential. For the present we strongly recommend to Government the appointment of 10 to 15 Horticultural Assistants working directly under the Fruit Specialist; but we suggest that the whole question of fruit industry should be examined by a

small committee of experts not only to settle lines of progress but to consider the feasibility either of creating a separate department of horticulture or of allocating a specially trained staff for the purpose. We think that without special training, for 18 months or two years, it is not possible to have men who are fully qualified to give advice regarding fruit growing and fruit preservation. We suggest for consideration that at the Lyallpur Agricultural College, such students as desire to do this, should be permitted to devote the last two years of the four years' course to a special study of the fruit industry or alternatively study of fruit should be a major subject like Entomology, Botany, etc., for the Degree Course. Men so qualified could then function with advantage as Horticultural Assistants.

Fruit Juice Business

We are further of opinion that there is great scope for the development of fruit juice industry. Educated young men could take up this business with advantage to themselves. It does not require much capital and the products, if prepared with care, should command a ready sale. To give a fillip to the industry we recommend that such graduates of the Agricultural College as take up a special course in fruit, should be given State aid to help them to establish small business for the manufacture of fruit juices, should they desire to do so. The State aid will take the form of a loan recoverable in easy instalments, the first instalment being payable after the lapse of a suitable interval during which business might establish itself.

We are informed by Mr. Stewart that large areas of land are available, along

side the canals, and this land can be utilized advantageously for planting fruit gardens. This land is in the possession of the canal Department. We think the suggestion is a practical one. Small plots of suitable size could be given to unemployed educated young men. We suggest this, subject to the provision, that no question of water-logging or other danger to the canal system is involved.

Extra Water For Fruit Growing

Further, to encourage fruit growing we recommend extra allowance of water for irrigation. We understand that certain proposals for reducing assessment on garden areas are now under the consideration of Government. We recommend that these proposals should be considered very sympathetically in view of the importance of the industry to the future well-being of the province.

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ANNUAL REPORT

of the

*Punjab P. C. Fruit Development Board for the year
ending 31st December, 1939 by S. S. Lal Singh,
B.Sc. (Hons.); M.Sc. (Calif.);
the Honorary Secretary of the Board.*

Mr. President and Gentlemen,

The Punjab Fruit Development Board has completed four years of its eventful life and we have assembled here once again to make a survey of the work done during the last year and to chalk out our programme for the future. The President of the board has made an elaborate and critical survey of the origin, aims, accomplishments and disappointments, the Board has met, since its inception in 1936. I shall now give a brief report on the salient developments in the activities of the Board during the year 1939 only.

During the year under review, the Managing Committee of the Board held three meetings and the various Standing Committees and Sub-Committees met thirteen times. In addition to this, two influential deputations of the Board waited on the Hon'ble ministers of the Punjab Government during the course of the last Budget Session.

The Fruit Journal Standing Committee met twice in 1939.—During the period under review two Special Numbers, viz. 1939, Annual Number and the Mango Number; and two ordinary issues were published. In this connection it may be mentioned that altogether twelve issues,

have been published so far, touching almost all aspects of horticulture and fruit preservation. The total number of pages and items covered by the four issues published during 1939, are as under:—

Issues	Pages in English Section.	Items in English Section.	Pages in Urdu Section.	Items in Urdu Section.
Jan. 1939.	63	17	44	12
April, 1939.	75	17	40	11
July, 1939.	54	19	51	13
Octo., 1939.	48	16	21	8
Totals:-	240	69	156	44

The Mango Number of the Fruit Journal has proved to be a great success both from the financial and the educative point of view. This number has been responsible for attracting 95 new subscribers to the journal, most of whom are from outside the Punjab and some of them even from outside India. The present 1940 Annual Number is yet the encyclopaedic compilation, worthy of the occasion, detailed comment regarding which will be made in the next year's report.

It is gratifying to note that the Punjab Fruit Journal has acquired an all India importance and continues to be not only a self-supporting but a paying venture. In

addition to the consolidated surplus of Rs. 1,724/10/6 up to 31-12-38, the undertaking has shown an additional surplus of Rs. 349/5/3 as recently audited during seven months *i.e.*, between 1-1-39 to 31-7-39, making a total net surplus of 2,073/15/9 as given at the end of the report.

In addition to the regular members of the Board, who are *ipso facto* subscribers of the journal, the number of non-member subscribers which was 277 on 31st December, 1938 has increased to 484 on 15-12-1939, showing an increase of 72 per cent representing almost all parts of India. Of these non-member subscribers no less than 215 are from outside the Punjab.

It has been a labour of love for the editors and contributors alike. But for the unstinted support of my colleagues and subordinates, the journal would not have been what it is to-day.

The names of these gentlemen are given below along with the number of articles contributed by each.

Names of Contributors.	No. of Contributions.
1. S. S. Lal Singh.	33½
2. S. Bal Singh.	7½
3. Dr. Sham Singh.	15
4. Mr. Basant Singh.	16
5. Mr. P. Maya Dass.	10½
6. Dr. G. Lal.	8
7. Dr. Khan A. Rahman.	4
8. Mr. Harindar Singh, Dinsa.	10
9. Mr. G. L. Tandon.	8
10. L. Amolak Ram.	8
11. Dr. A. Sattar.	2
12. Dr. A. A. Khan.	3
13. Mr. S. S. Bhatt, Horticulturist Baroda State.	2
14. Mr. Abdul Hameed.	4
15. Mr. Dyal Singh Johar.	3
16. Mr. Sangat Singh.	8½
17. Dr. A. Waheed.	7½
18. K. S. Ch. Niaz Ali Khan.	3
19. Mr. Musahib-ud-Din.	4
20. S. Pritam Singh.	3

I also appreciate the services rendered by Mr. K. L. Kohli, our Asstt. Secy. who has proved a successful commercial Manager-cum-News Editor.

Another welcome addition to the staff of the Board is that of Sardar Manohar Singh Nirmal who I trust would prove another useful hand for the periodical.

Bulletin Publications.— Five Bulletins on the Fruit Industries of (1) Egypt, (2) Palestine, (3) Italy & Sicily, (4) France and Switzerland and (5) Kashmir, brief mention regarding which has made in the last report, have also been very well received by the public and the Board has now more than recovered the entire cost of these costly publications even though about 3/4th of the stock is still in hand.

The Bud Selection Programme.—

After considerable deliberations and representations to the Government, lasting for over three years, the Bud Selection Standing Committee of the Board has taken up this bold programme from this citrus season, the success of which is bound to raise immensely the standard of gardening in the province. For this purpose a qualified staff comprising a Bud Selection Supervisor, an experienced Graduate of the Punjab Agricultural College, Lyallpur and five trained 'malis' has been appointed. The staff after receiving training under the Fruit Specialist, Punjab, commenced its work on December 1, 1939, of surveying important orchards of the province. The staff has already surveyed important orchards of the Montgomery District, and Pathankot side. The attempt of the Board has been very well received in the Districts and the preliminary weekly reports of the progress of the scheme are indeed very encouraging. To this date no less than 325 trees of outstanding merits of the citrus family have been marked out, and some of these trees are reported to be yielding 800 to 1000 of malta fruits each. Arrangements are being made with the proprietors of such trees to secure budwood from these selected trees and to propagate the same in thousands for the benefit of the members of the Board at the Fruit Development Board Nursery which is being started at Lyallpur.

The scheme is at present estimated to cost the Board Rs. 500/- a month, but with the organisation of the Board's nursery the expenditure is estimated to rise to about Rs. 700/- per month.

The Board has already staked its resources to make the scheme a success. I have no doubt that this scheme would not only render a most valuable assistance to the Punjab Fruit Industry but would pay its way in the near future when we begin to supply the nursery plants to the members. The scheme badly needs financial support and other facilities from the provincial Government, for which representation was again made this year. We feel sure that after a lapse of three or four years this scheme will prove another paying venture for the Board.

Irrigation and Revenue Standing Committee.—The Irrigation Department, vide their communication No. 1376 Rev: of 20-10-38 to the President of the Board had tentatively agreed to recommend the restoration of the concession for the enhanced supply of water for gardens.

Although the said intimation was given as far back as 1938, nothing further was heard in the matter. Considering that the correspondence would not lead us very far, an influential deputation of the Board waited on the Hon'ble Minister for Revenue on 11th March, 1939, in pursuance of the resolution of the Irrigation and Revenue Standing Committee meeting of 6-3-1939. On this occasion the Chief Engineers of the Irrigation Department were also present.

The Hon'ble Minister for Revenue very kindly gave a patient hearing to the view point of the members of the deputation. It was decided in the meeting by the Hon'ble Minister for Revenues and the Chief Engineers that double supply of water, for gardens in the canal irrigated areas will be allowed, on certain conditions, already referred to in the Presidential speech. I regret to say, however, that although ten months are about to pass, the decision has not been implemented as yet.

Evidence before the Canal Act Committee.—With a view to represent the long standing grievances of the fruit growing community, regarding the above and other allied matters *e.g.* Kharaba, double Revenue and Malkana charges etc. the Hony. Secretary of the Board gave an

evidence before the Canal Act Committee on 27th April, 1939, at Lahore.

Fruit Market Standing Committee.—In the wake of increased production, the question of proper marketing becomes very necessary. This committee and its sub-committees held five sittings during the year under report and hammered scheme after scheme, but unfortunately has so far met with many a stumbling block. In pursuance of the decision of the Fruit Marketing Standing Committee meeting of 16-4-1939, a deputation of the Board waited upon the Honourable Premier, Punjab Government, on the 19th April, 1939 to once again emphasise for an immediate grant of the promised Nazul plot outside Shahalmi Gate, Lahore, or an other Nazul plot for the proposed Provincial Fruit Market at Lahore.

The Hon'ble Premier was again kind enough to express his warm sympathy with the scheme of the Board and promised to help us to proceed with the Marketing Scheme at the site asked for. Now after a lapse of six months we learn that the Administrator, Lahore Municipality is attempting to establish a fruit market in Lahore in accordance with his own plan and the work is being expedited. Very little progress is possible unless either the Market site is given to the Board by the Government or the proposed Municipal Market comes into existence where the Fruit Development Board can start its work.

Assembly Members "Fruit Group".—The Assembly Members "Fruit Group," during the last budget session of the year under the active leadership of S. B. Ujjal Singh, has rendered valuable service in organising deputations on the Punjab Ministers, tabling resolution, for the promotion of the provincial fruit industry, which culminated in forwarding of a weighty memorandum signed by about sixty M. L. As., mostly from the Government benches, to the Hon'ble Minister for Development. The leader of Opposition in the Punjab Legislative Assembly also issued a similar press statement in support of the fruit industry.

Other Activities.—Not only the members of the Board but the fruit growers all over India have begun to increasingly avail of the machinery of the Board to solve their day-to-day problems. Dozens of enquiries are received from fruit growers outside the Punjab (largely subscribers of the Punjab Fruit Journal) relating to matters like supply of fertilizers, garden requisitions, literature, horticultural advice, etc. The following few items of provincial interest need only be mentioned.

Representation for the extension of concession of cheap railway freights for the Kulu Fruits.—As a result of representation of the Honorary Secretary of the Board, at the request of Mr. A. H. Lee, a leading fruit grower of Kulu, the N.-W. Ry. authorities have been pleased to extend the concession of 3rd parcel rates with effect from 1st August, 1939, for fresh fruits of all descriptions from Baijnath Paprola to Bombay V. T., Bombay Central, Howrah *vide* Endt. No. 352R/357, dated 27-7-39.

(ii) **Representation regarding re-opening of out-agencies** Jogindranagar, Mandi, Sultanpur (Kulu) and the seasonal Out Agencies at Raison Bagh, Katrian and Manali:—

At the instance of the Secretary of the Kulu Fruit Growers' Association, representations were made to the Director of Agriculture, Punjab, N.-W. Ry. authorities, the Commissioner, Jullundur Division and other officers concerned, for the re-opening of Out-Agencies in question.

(iii) **Representation to the Hydro-Electric Department.**—The representation of M. Aziz-ud-Din and other fruit growers of Sujjanpur (near Pathankot) regarding the desirability of extension of the hydro-electric current to the fruit gardens of the said area, was duly forwarded to the Executive Engineer, 1st constructions Division, Hydro-Electric Department, Lahore, for doing the needful. The matter is now having due consideration of the Department concerned.

(iv) **Water application for enhanced supply of water.**—About a dozen and a half applications for enhanced supply of water for gardens of the members of Board have been forwarded to the Agricultural Department, Punjab for forwarding the same to the Irrigation Department.

(v) **Representation** has also been made to the Imperial Council of Agricultural Research, Delhi, requesting for special subsidy of Rs. 1,000/- per year for the publication activities of the Board.

Registration of Reliable Nurserymen, Seed Stores and Gardening Firms.—With a view to keep a check on the growing menace of the supply of unreliable plants and other gardening requirements, the Committee decided that a regular register of the approved nurseries, seed stores, and gardening firms may be opened under the auspices of the Board. An annual registration fee of Rs. 5/- has been fixed for the present which may be increased after two years if necessary. All nurseries of gardening, firms, etc., will be registered only after the receipt of a favourable report from the Agricultural Department of their respective provinces.

A preliminary list of addresses of over 176 leading nurserymen and seed stores have been compiled from all over India to make a necessary selection out of them.

Membership.—The total membership of the Board to-day stands at 473, but it is regretted that a large number of members have not so far paid up their annual dues notwithstanding a number of reminders. The number of life-members stood at 91 on December 15, 1939.

Local Fruit Growers' Associations.—There are now in all, 17 fruit growers' associations in various parts of the province. Associations of Karnal, Hoshiarpur, Sheikhpura and Lyallpur have been successfully holding district fruit shows.

Office Work.—With the expansion of the Fruit Journal work and the start of the Bud Selection Scheme, both the routine

and development work of the Board has considerably increased. The figures for despatch and receipt of letters for 1939 stand at 9549 and 2626 respectively as against 7188 and 2002 in 1938.

New Programme of Work.—It is proposed, if sufficient funds be forthcoming from the Government and local bodies and last but not the least, from the members, to extend the activities of the Board in the coming year, in the following directions :

1. To supplement the activities of the Punjab Fruit Journal by bringing standard horticultural literature both in vernacular as well as in English.
2. To consolidate the work of the Bud Selection Scheme and to organize at a very early date, a Central Standard Nursery at Lyallpur under the auspices of the Board.
3. To undertake marketing programme if the site is given over to the Board by the Government or if the proposed Municipal market is established.
4. Further with a view to vitalise the machinery of the Board in the Districts, it is proposed to appoint some advisory staff under the Honorary Divisional Propaganda officers of the Board to visit, by turn, the orchards of the members for necessary advice and assistance in horticultural operations including grafting, budding, etc.
5. Co-ordination of the activities of various district fruit growers associations and to secure their affiliation with the Provincial Board.
6. It has been decided by the Managing Committee to organise tour parties to the important orchards in the province twice a year, for the benefit of those interested in fruit gardening.

Donations from local bodies.—The following local bodies have contributed the amounts, noted against their names, as general donations towards the Punjab Fruit Development Board, for which the Board is grateful.

(i) District Board,
Amritsar, annual contribution for the year 1939 ... Rs. 200 0 0

(ii) Amritsar Municipal
Committee, annual contribution for 1938 and 1939 ... Rs. 100 0 0

(iii) District Board,
Ferozepore, annual contribution for the year 1938 and 1939 @ Rs. 25/- per year ... Rs. 50 0 0

(iv) District Board,
Lahore, annual contribution for the year 1939 ... Rs. 100 0 0

Total ... Rs. 450 0 0

Considering the poor response from the local bodies, a strong representation was also made to the Hon'ble Minister for P.W.D. and to District Officers to advise local bodies of the province to earmark $\frac{1}{4}$ percent (quarter percent) of their annual revenues for contribution to the Punjab Fruit Development Board for the development of the provincial fruit industry in general and fruit gardening in their respective areas.

Quite a large number of members of the Board are also members of different local bodies in the province, and I trust they will use their influence in securing the rightful share for their Fruit Board out of the local Bodies Revenues.

Finances.—Due to conservative financial policy followed by the Managing Committee, the Board, as per Balance Sheet on 31-7-39, has built a fair bank balance of Rs. 8,152/7/3 during the course of the last few years, notwithstanding the very little government aid. But with the start of various beneficial programmes from this season e.g. Bud Selection etc. the earned resources are likely to be depleted before long. Accordingly, we have again approached the Government that at least the following grants may be given to the Board from the coming year to meet the requirements of the schemes :—

(i) That the current year's allotted non-recurring subsidy of Rs. 2500/- may kindly be raised to an annual recurring grant of Rs. 5,000/-.

(ii) A special lump sum of Rs. 10,000/- may very kindly be earmarked for conducting the Bud Selection Programme.

Accounts.—The Accounts Sub-Committee of the Board, consisting of S. B. Hari Singh, Rtd. Deputy Commissioner, Criminal Tribes, L. Duni Chand, Bar-at-Law, Mr. Jaigopal Bhandari (retired Acctt.

General Punjab), on the basis of the Audit Notes for the periods ending 31-1-38 and 31-12-38 as well as Inspection Note dated 30-11-38 has recorded that the accounts of the Board have been kept very satisfactorily in the previous years. The accounts of the current period from 1-1-39 to 31-7-39 have also been audited by Ch. Nur Mohammad, Inspector, Co-operative Societies, Jaranwala on 16/21 December, 1939. Brief extracts from the report of the Accounts Sub-Committee of the Board as well as from that of the recent audit note are reproduced below.

Accounts Sub-Committee Report. "It is gratifying to note that all these reports speak well of the consistent progress made by the Board during the course of the last two years and that the accounts are properly kept and the working of the Board especially the commercial side of the Fruit Journal has become very efficient.

It would not be out of place here to mention the improvement made in the financial position of the Board.....Due to shrewd financial policy and untiring efforts of the Hony. Secretary, the Board has been able to make good the heavy amount of the preliminary loss amounting to Rs. 1564/7/3 and has built a substantial Fruit Journal Reserve surplus of Rs. 2,000/-.

Audit Note dated 21/12/39:— "I have compared the entries of both the cash books with the ledgers concerned. I have compared the entries of the receipts with those of the counterfoils. No mistake was noticed. Entries of both the cash books were checked with those of the ledgers concerned and no mistake or discrepancy was found in this respect as well.

Regarding Fruit Journal, during the period under audit, an amount of Rs. 694/4/- was received as advertisement revenue for the Journal which is very encouraging. Credit for all this expansion is mostly due to the efforts of S. S. Lal Singh, Hony. Secretary and Chief Editor of the Journal, and for its financial side to the Asstt. Secretary and the staff.....

"The general condition of the Board is quite promising. It has so far received a non-recurring grant of Rs. 2500/- per year during the years 1938 and 1939. The grant is quite justified in view of the developments so far achieved."

"The staff is quite efficient. Activities of the Board are on daily increase. From the accounts of finances of the period under audit it is evident that the office work of the Board has considerably improved as well as increased, particularly the accounts side. The expansion regarding the commercial side of the Fruit Journal is especially noticeable for which it seems the Asstt. Secretary and the staff have made considerable labour."

My thanks are due to members of the Accounts Sub-committee, Mr. J. D. Bhandari, Retd. Accountant General Punjab, S.

B. Hari Singh, Retd. Deputy Commissioner, Criminal Tribes and L. Duni Chand, Bar-at-Law for the pains they have taken in scrutinising these reports.

Appreciation.—Before I close, I wish to accord my heartiest thanks to the members of the Managing Committee, Standing Committees and Sub-committees, for the keen interest they have been evincing in furthering this noble cause, even at considerable personal inconvenience. I am particularly indebted to Raja Sir Daya Kishen Kaul; S. B. Ujjal Singh; L. Mehar Chand Mahajan; Mr. Abdul Hameed Khan; R. S. Janki Das; S. B. Hari Singh; Capt. L. Mitchell; K. S. Ch. Niaz Ali Khan; S. Kartar Singh, Dewana; L. Parkash Chandra Mehra; L. Duni Chand; Dr. Mushtaq Ahmad and S. Satwant Singh for the very valuable co-operation they have always extended to me in executing the activities of the Board. I am also grateful to S. Kartar Singh, Marketing Officer, Punjab and his Assistant, S. Pritam Singh, as also to Ch. Nawab Ali, Asstt. Registrar Co-operative Societies as well as to Ch. Mohammad Shareef, Inspector, Co-operative Societies for their valuable advice in many technical matters. My thanks are also due to Kh. H. M. Sadiq, Deputy Director of Agriculture, Jullundur Circle and S. S. Kartar Singh, Secretary District Board, Amritsar, who have been very helpful to me in several ways.

Words fail me to express my deep sense of gratitude to the Hon'ble Ch. Sir Shahab-ud-Din, President of the Board, for his very able guidance and unstinted help in the efficient execution of the activities of the Board and also the Hon'ble Justice Tek Chand, vice-president of the Board who gave me necessary time, off and on, for discussing various important matters. Lastly I am grateful to Mr. H. R. Stewart, Director of Agriculture, Punjab who has given the Board unstinted support, in representing the cause of the fruit growers in various matters like supply of water and grant to the Board etc. and for giving facilities to me in the discharge of my duties.

LAL SINGH (SARDAR SAHIB),
Honorary Secretary, Punjab P. C.
Fruit Development Board, Ltd.

**THE "PUNJAB FRUIT JOURNAL" TRADING ACCOUNT AS ON
31st JULY, 1939.**

	Dr. Rs.	Cr. Rs.	Net Cr. Rs.
Credit balance brought forward from the credited Balance Sheet as on 31-12-38 ...			1,724-10-6
Fruit Journal Subscription (non-members) for the period from 1-1-39 to 31-7-39 ...		519-1-0	
Income from Fruit Journal advertisements for the period from 1-1-39 to 31-7-39 (recovered and recoverable) ...		694-4-0	
Subscription from Members ...		302-0-0	
Casual Sales for the period under reference ...		106-13-0	
Fruit Journal Printing paid for the period from 1-1-39 to 31-7-39 ...	547-11-0		
Fruit Journal Printing payable for the above period ...	251-12-0		
Postage for the above period ...	305-14-9		
Fruit Journal Establishment for the above period ...	145-0-0		
Fruit Journal Sundries for the above period ...	22-7-0		
Totals	Rs. 1,272-12-9	1,622-2-0	
Net Surplus of the period between 1-1-39 to 31-7-39 ...			<u>349-5-3</u>
Grand Total (Net Surplus on 31-7-39) ...			<u><u>Rs. 2,073-15-9</u></u>

*Note :—*The following items are recoverable in the above account :—

1. Fruit Journal advertisements outstanding bills ...	Rs. 391-15-0
2. Fruit Journal Casual Sales outstanding bills ...	Rs. 32-0-0
3. Fruit Journal Subscription outstanding bills ...	Rs. 83-8-0

Total ... **Rs. 507-7-0**

Sd. K. L. KOHLI,
Asstt. Secretary,
Punjab P. C. Fruit
Development Board, Lyallpur.

Sd. Ch. NUR MOHAMMAD,
Inspector,
Co-operative Societies,
Jaranwala.
(Auditor)

**PROFIT & LOSS STATEMENT OF THE PUNJAB PROVINCIAL
CO-OPERATIVE FRUIT DEVELOPMENT BOARD, LTD., FOR THE
PERIOD FROM 1-1-39 TO 31-7-39.**

Profits		Losses	
Interest received on Bank Deposits	Rs. 109-13-3	Establishment Account	Rs. 1,064-13-0
Miscellaneous Income from Local Bodies	Rs. 250-0-0	General Printing Account	Rs. 190-12-6
Grant in Aid from the Government	Rs. 2,500-0-0	Stationery Account	Rs. 170-10-0
Profits from the Fruit Journal	Rs. 349-5-3	Postage General Account	Rs. 100-4-6
		T. A. Account	Rs. 91-9-0
		Stock Depreciation Account	Rs. 61-9-2
		Publicity Account	Rs. 22-4-0
		Sundries Account	Rs. 22-6-6
		Telephone Account	Rs. 20-0-0
		Daily Allowance of the Assistant Secretary	Rs. 12-0-0
		Banking Charges Account	Rs. 3-6-0
		Tonga Charges Account	Rs. 1-13-0
		Kashmir Bulletin Debit Balance	Rs. 13-2-0
		Debit Balance in Bulletins Account	Rs. 3-1-0
Total	Rs. 3,209-2-6	Total	Rs. 1,777-10-8
		Profit for the period from 1-1-39 to 31-7-39	Rs. 1,431-7-10
		Grand Total	Rs. 3,209-2-6

Sd. K. L. KOHLI,
Asstt. Secretary,
Punjab P. C. Fruit
Development Board, Lyallpur.

Sd. Ch. NUR MOHAMMAD,
Inspector,
Co-operative Societies,
Jaranwala.
(Auditor)

BALANCE SHEET OF THE PUNJAB PROVINCIAL CO-OPERATIVE FRUIT DEVELOPMENT BOARD, LTD., AS ON 31-7-1939.

Liabilities :—

Membership Subscriptions	...	...	Rs. 6,870-11-6
Fruit Journal Printing Bill payable	...	...	Rs. 251-12-0
Individual Deposits	...	...	Rs. 2-0-0
Previous Profits of the Fruit Journal Account	...	...	Rs. 1,724-10-6
Profits for the period from 1-1-39 to 31-7-39	...	...	Rs. 1,431-7-10
Total			Rs. 10,280-9-10

Assets :—

Deposit with the Punjab P. C. Bank, Ltd., Lahore (Savings Account)	...	...	Rs. 5,958-13-9
Deposit with the Lyallpur C. C. Bank, Ltd., (Current Account)	...	...	Rs. 2,171-2-6
Imprest with Honorary Secretary Account	...	...	Rs. 22-7-0
Stock	...	...	Rs. 213-6-10
Fruit Journal Outstanding Bills	...	...	Rs. 507-7-0
Bulletins Outstanding Bills	...	...	Rs. 5-4-0
Telephone Bills recoverable	...	...	Rs. 12-8-0
Suspense Account	...	...	Rs. 37-0-0
Cash in hand	...	...	Rs. 11-9-3
Postage in hand	...	...	Rs. 49-0-0
Previous Losses as shown in the last Balance Sheet	...	...	Rs. 1,291-15-6
Total			Rs. 10,280-9-10

I have audited the balance sheet of the Punjab Provincial Co-operative Fruit Development Board, Ltd., as on 31-7-1939. In my opinion such a balance sheet, subject to my remarks given in the Audit Report, exhibits the true and correct views of the Board's affairs to the best of my information and the explanations given to me and as shown by the books of the Board.

Sd. K. L. KOHLI,
Asstt. Secretary,
Punjab P. C. Fruit
Development Board, Lyallpur.

Sd. Ch. NUR MOHAMMAD,
Inspector,
Co-operative Societies,
Jaranwala.
(Auditor)

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To Subscribers of the Punjab Fruit Journal

Most of the subscribers of the Punjab Fruit Journal started subscribing to the journal from July 1939. With the supply of this issue their annual subscription expires. They are requested to remit Rupees three by return to renew their subscriptions during this quarter, failing which the next issue of the journal will be sent per V. P. P. of Rs. 3/8/-

Annals of the Board

By

K. L. Kohli, M.A., L.S.G.D.,

Asstt. Secy., Fruit Development Board,

Lyallpur.

Since the inaugural Annual General Meeting of the Board held in April, 1936 some four years ago, members had not witnessed the like of the assembly that assembled at the Town Hall, Lahore, on the 10th January, 1940. In this Annual Meeting, which was presided over by the Hon'ble Ch. Sir Shahab-ud-Din, about 200 influential members of the Board and district fruit growers' associations attended from the various parts of the Province. Among those present were the Hon'ble Major Nawab Sir Sikandar Hyat Khan, K.B.E., Premier of the Punjab, the Guest of Honour, the Hon'ble Sir Sundar Singh Majithia, Minister for Revenue, and the Hon'ble R. B. Ch. Sir Chhotu Ram, Minister for Development and Vice-Patron of the Board. The distinctive feature of this year's meeting was that, besides others, it was attended by the representatives of a number of important District Boards and Municipal Committees of the Province, an indication of the growing importance of this annual provincial congress of the fruit growing community of the province.

The Presidential Address of the Hon'ble Ch. Sir Shahab-ud-Din along with a brief extempore reply thereto, by the Hon'ble Major Nawab Sir Sikandar Hyat Khan, K.B.E., Premier of the Pun-

jab, appears elsewhere in this issue. The following are some important decisions arrived at in the Annual General Meeting and subsequent developments thereto:

1. The Question of enhanced supply of water for gardens was considered and the following resolution was adopted:

"This Annual General Meeting of the Fruit Development Board emphatically endorses the views expressed by the President of the Board in his Presidential address regarding irrigation facilities and other matters and urges upon the Government to take immediate steps to give effect to those suggestions."

This matter since then has been seriously engaging the attention of the President of the Board. During the course of the recent meeting of the Managing Committee of the Board, held on 4th February, the President very kindly undertook to discuss this matter further with the Hon'ble Minister for Revenue so that the decisions already arrived at by the Irrigation Department may be implemented at an early date. In this connection the members of the "Assembly Fruit Group" have also authentically voiced the feelings of the fruit growing community during discussion in the Punjab Legislative

Assembly in the current budget discussions. We are especially indebted to S. B. Ujjal Singh, Mian Nur Ullah, M.L.A., and Sodhi Harnam Singh, M.L.A., for having rightfully voiced our feelings in this matter.

2. Proposal to raise the Punjab Fruit Development Board to a Provincial Statutory Body.—It is becoming increasingly evident that with a view to extend the multifarious beneficent programmes the Board has in view, immediate measures should be taken to consolidate the financial position of the Board and bring it to a sounder footing. With this end in view, this proposal was included in the Agenda of the Annual Meeting so as to obtain the mandate of the general body of the fruit growing community in the matter.

Ch. Nazar Muhammad, R. S. Janki Das and S. B. Dilbagh Singh spoke in favour of the above proposal, and S. B. S. Ujjal Singh, M.L.A. moved the following resolution:—

"This general meeting of the Fruit Development Board requests the Government to levy a cess of four annas per acre on the garden areas, the proceeds of which may be entrusted to the Fruit Development Board for the development of the fruit industry in the Punjab under the guidance of the Punjab Agricultural Department." The resolution was passed unanimously. In pursuance of the above, the Punjab Fruit Cess Bill, 1940 has been drafted and entrusted to S. B. Ujjal Singh and other members of the 'Fruit Group' of the Punjab Legislative Assembly to bring the same on statute at an early date.

3. The Nursery Scheme (Bud Selection Scheme).—The members of the Board will be glad to know that the Board has already made a considerable headway in this unique promising programme. In this citrus season, about 600 trees of outstanding merit were located and marked by the Bud Selection Supervisor and his staff; some of these trees are reported to be yielding about 800 to 1,000 malta fruits each. Arrangements have been made to obtain budwood from such trees of merit by paying handsomely to the growers concerned. About 18,000 citrus plants have already been budded in the Board's nurseries at Mian Channu and Jamalpur. Members may rest assured that by February-March, 1941 they can expect from the Board's nurseries a fairly good number of citrus plants of merit at popular prices. In addition to the above, with a view to fully meet the requirements of members regarding supply of quality plants, arrangements are under progress to set up a Central Nursery at Lyallpur for which purpose Khatti beds have already been set up.

To avail of supply of these unique plants members are requested to hurry up and renew their membership and place their reservation order for plants right now.

4. Proposal to declare fruits and vegetables as agricultural produce in terms of the Punjab Agricultural Produce Market Act 1939.—

In view of the assurance of the Hon'ble Premier in the matter, during the course of his Annual address, that this question had not so far been examined, but would receive every consideration and that

there was nothing to prevent fruits and vegetables being brought under the Act whenever it was considered desirable. The House adopted the proposal.

5. Presentation of the Audit Report for the current year upto 31st Ju'y, 1939 with particular reference to the Balance Sheet and accounts of the Board:—

The Honorary Secretary informed the House that accounts of the Board had been audited upto 31/7/39 by the Co-operative Department and the Balance Sheet as on 31/7/39 had been prepared. The House adopted the Balance Sheet as on 31/7/39 and constituted the Accounts Sub-Committee, comprising Mr. Jai Gopal Bhandhari, Rtd. Accountant General, Punjab, and S. B. Hari Singh, Rtd. Deputy Commissioner, Criminal Tribes, to scrutinise the audit report, and report regarding the same to the Managing Committee of the Board.

The House also approved that the total net profits of the Board, on different accounts as per balance sheet as on 31/12/38 and subsequent Balance Sheet as on 31/7/39, may be allocated to different accounts after consulting the Co-operative Department, after first taking the necessary amount into Reserve in conformity with By-law 28.

6. New Year's Office Bearers and Members of the Managing Committee:—

The following office bearers and members of the Managing Committee of the Punjab Fruit Development Board were elected for the year 1940:—

1. The Hon'ble Ch. Sir Shahab-ud-Din, 3, Durand Road, Lahore (President).

2. The Hon'ble Mr. Justice Bakhshi Tek Chand, Judge, High Court, Lahore (Vice-President).

3. S. S. Lal Singh, Fruit Specialist, Punjab, Lyallpur (Honorary Secretary).

4. Ch. Mushtaq Ahmad, P.V.S., Class I, Punjab Veterinary College, Lahore (Joint Secretary).

5. L. Mehar Chand Mahajan, Advocate, Egerton Road, Lahore (Treasurer).

6. The Financial Commissioner (Development), Punjab, Lahore (Ex-officio member).

7. The Director of Agriculture, Punjab, Lahore. (Ex-officio member).

8. The Commissioner, Rural Reconstruction, Punjab, Lahore. (Ex-officio member).

9. The Chief Engineer, Irrigation Works, Punjab, Lahore. (Ex-officio member).

10. Mr. Mitchell of Indian Mildura Fruit Farms, Ltd. Renala Khurd, Distt. Montgomery.

11. S. B. Ujjal Singh, M.L.A., 94, Wellington Mall, Lahore Cantt.

12. Raja Sir Daya Kishen Kaul, Lawrence Road, Lahore.

13. Nawab Sir Malik Mohd. Hayat Khan Noon, M.L.A.

14. R. B. Bawa Natha Singh, Retd. Chief Engineer, Irrigation Department, 90, the Mall, Lahore.

15. S. B. Hari Singh, Retd. Deputy Commissioner, Criminal Tribes, 69-F, Model Town, Lahore.

16. Mr. J. G. Bhandhari, C.I.E., Retd. Accountant General, Punjab, 6, Canal Bank Road, Lahore.

17. R. S. Janki Dass, Prop: Janki Dass & Co., Nila Gumbad, Lahore.

18. K. S. Chaudhri Niaz Ali Khan, Jamalpur Fruit Farm, Railway Station Sarna, Near Pathankot, District Gurdaspur.

19. L. Duni Chand, Bar-at-Law, 43, Mozang Road, Lahore.

20. Lt. S. Naunihal Singh Mann, O.B.E., M.L.A., Honorary Magistrate I Class Rais-i-Azam, P. O. Manawala, District Sheikhpura.

21. Ch. Nazar Mohd., Member, Debt Conciliation Board, Wazirabad, District Gujranwala.

22. S. Kartar Singh Diwana, Chak No. 37 Sardarwala, District Sheikhpura.

23. S. Satwant Singh, Rais, Bara Farm, P. O. 186/9-L, Distt. Montgomery.

24. R. B. Dr. Maharaj Krishen Kapur.

25. L. Parkash Chand Mehra, Representative, Municipal Committee, Amritsar.

26. Ch. Abdul Haq, Member, Distt. Board, V. & P. O. Nag Kalan, Distt. Amritsar.

27. S. Udham Singh, Member, D. B. V. Jalalpur, P. O. Majitha, Dt. Amritsar. (Representative, District Board, Amritsar).

28. Mr. Abdul Hamid Khan, General Manager, Feroz Printing Works, 119 Circular Road, Lahore.

29. S. Nahar Singh of Grewal Nursery, Bishenpura Estate (Payal), Distt. Ludhiana.

30. K. B. Khan Farid Khan, Hony. Magistrate, Khanewal, Distt. Multan.

(7) The Newly elected Managing Committee meets:—

The inaugural meeting of the newly elected managing Committee was held on the 4th February, 1940, and the following important Standing Committees and Sub-Committees were formed for the year 1940:—

1. Publication Standing Committee:

1. The Hon'ble Ch. Sir Shahab-ud-Din (President).

2. R. S. Janki Dass.

3. Prof. Mushtaq Ahmad.

4. Mr. Abdul Hamid Khan.

5. S. Satwant Singh.

6. S. Kartar Singh Dewana.

7. S. S. Lal Singh (Honorary Secy.).

2. Fruit Marketing Standing Committee:

1. The Hon'ble Ch. Sir Shahab-ud-Din, (President).

2. Raja Sir Daya Kishen Kaul.

3. L. Parkash Chand Mehra, Representative Amritsar Municipal Committee.

4. L. Mehar Chand Mahajan, Advocate.

5. S. B. Hari Singh.

6. Mr. Mitchell of Indian Mildura Fruit Farms, Ltd.

7. K. S. Ch. Niaz Ali Khan.

8. L. Duni Chand, Bar-at-Law.
9. Mr. Abdul Hamid Khan.
10. R. S. Janki Dass.
11. Prof. Mushtaq Ahmad.
12. S. Kartar Singh, Marketing Officer.
13. S. Pritam Singh, Asstt. Marketing Officer.
14. Mr. J. G. Bhandhari.
15. R. B. Dr. Maharaj Krishen Kapur.
16. S. S. Lal Singh (Hony. Secy.).

3. Irrigation & Revenue Standing Committee:

1. The Hon'ble Ch. Sir Shahab-ud-Din (Chairman).
2. The Financial Commissioner (Development), Punjab.
3. The Director of Agriculture, Punjab.
4. Raja Sir Daya Kishen Kaul.
5. S. B. Ujjal Singh, M.L.A.
6. S. B. Hari Singh.
7. Ch. Nazar Mohd.
8. S. Kartar Singh Dewana.
9. K. S. Ch. Niaz Ali Khan.
10. S. Satwant Singh.
11. K. B. Farid Khan.
12. Bawa Natha Singh, Rtd. Chief Engineer, Irrigation Works.
13. Nawab Sir Mohd. Hayat Khan Noon, M.L.A.
14. Lt. S. Naunihal Singh Mann, M.L.A.
15. S. S. Lal Singh (Hony. Secy.).

4. Nursery Standing Committee:

1. The Hon'ble Ch. Sir Shahab-ud-Din. (President).
2. K. S. Ch. Niaz Ali Khan.
3. Mr. Mitchell.
4. S. Kartar Singh Dewana.
5. Prof. Mushtaq Ahmad.
6. Pt. Gauri Shankar.
7. L. Duni Chand.
8. S. B. Ujjal Singh.
9. S. B. Hari Singh.
10. R. S. Janki Dass.
11. S. Satwant Singh.
12. S. S. Lal Singh (Hony. Secy.).

5. Products Standing Committee:

1. The Hon'ble Ch. Sir Shahab-ud-Din (President).
2. Mr. Mitchell of Indian Mildura Fruit Farms, Ltd.
3. L. Mehar Chand Mahajan.
4. S. B. Hari Singh.
5. Mr. Mukerjee of Hollow Metal Sheet Works, Lahore.
6. S. S. Lal Singh, (Hony. Secy.).
7. Mr. Paul.
6. Assembly Members' Fruit Group:
 1. S. B. Ujjal Singh "Convener".
 2. Nawab Sir Mohammad Shah Nawaz Khan.
 3. Nawab Sir Mohd. Hayat Khan Noon.
 4. Nawab Ahmad Yar Khan Daultana.
 5. Syed Amjad Ali.

6. S. Sampuran Singh.
7. Mian Nur Ullah.
8. S. Mohammad Hussain.
9. Lieut. Naunihal Singh.
10. Bhai Fateh Jang Singh.
11. Mahant Girdhari Dass.

7. Finance Standing Committee:

1. The Hon'ble Ch. Sir Shahab-ud-Din (President).

2. Mr. J. G. Bhandari (Convener).
3. S. B. Hari Singh.
4. Raja Sir Daya Kishen Kaul.
5. R. B. Dr. Maharaj Krishen.
6. Mr. Parkash Chand Mehra.
7. R. S. Janki Dass.
8. K. S. Ch. Niaz Ali Khan.
9. K. B. Farid Khan.
10. Mr. Mehr Chand Mahajan.
11. S. S. Lal Singh (Hony. Secy.).

7. Fixation of quorum and other rules for conducting Standing Committee meetings :

For this purpose a Sub-Committee comprising the following was constituted to recommend rules for quorum and other rules for conducting Standing Committee and Sub-Committee meetings etc.

1. Mr. J. G. Bhandari.
2. S. S. Lal Singh (Hony. Secretary).
3. Ch. Mohd. Shareef (Inspector, Co-operative Societies, Lahore Tehsil).

8. Appointment of some advisory staff for visiting by turn, the orchards of the members:

In view of the weak financial position of the Board the Committee decided that for the time being, service of the staff of the Bud Selection Scheme may be utilized for the purpose, whenever they may be available.

9. Re-consideration of the reply of Director of Agriculture, Punjab regarding sanctioning of honoraria to the distinguished departmental contributors of the Punjab Fruit Journal:

The Honorary Secretary read extracts from the D. O. letter No. 26626 dated 23/12/39 of the Director of Agriculture, Punjab addressed to the President of the Board. In the light of the above after some discussion the committee decided to drop the proposal of awarding honoraria to the departmental contributors.

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Discussions in the Punjab Assembly

(The cause of the fruit industry has been, time and again, debated in the Punjab Assembly. It is gratifying to note that the importance of the cause is recognised and supported both by the Government and the Opposition benches alike. Below are reproduced extracts from the speeches made by Sardar Hari Singh (Congress), Diwan Chaman Lal (Deputy Leader, Opposition) and S. B. S. Ujjal Singh (Parliamentary Secretary) during the 1939 budget session of the Punjab Legislative Assembly, which, it is hoped, will be found of interest.—Ed.)

S. Hari Singh's Speech

Representing the Opposition view-point, in the course of his speech, on 27th March, 1939, S. Hari Singh (Congress) remarked:—

I have got to say much about fruit industry in this province. In the year 1937, for the first time in provincial autonomy, Agriculture was discussed at the Simla session and it was Sardar Bahadur Sardar Ujjal Singh, I think, who moved the first cut motion to raise the question of improving fruit industry in this province. Then he was a free man, not a parliamentary Secretary. He had not then been initiated into the mysteries of preparing stereotyped replies and monosyllabic 'yes' and 'no' to questions from this side of the House. Citing the example of Egypt, he said: Look at Egypt, Rs. 15 lakhs are provided for fruit culture of that country and as regards fruit plants they are supplied free to the fruit growers and these fellows sitting on the Treasury benches are not supplying adequate number of seedlings to the farmers even on sale. In Italy land revenue is remitted for a number of years in the case of fruit growers who use approved methods of fruit growing. He said that there were only 70,000 acres under fruit garden in this province and contended that it was only about 20 per cent of the total cultivated area of the Punjab and the Minister for Development admitted that the area under gardens was very small and said it was not a matter to be proud of. What, may I ask now, has he done during the last two years to increase the area under fruit gardens? He said on that occasion that the ideal of the Punjab Government's Agriculture Department was that within a period of 5 years instead of 25 per cent of the area under gardens, they would have an area of 1% under gardens. Two years have now elapsed since that discussion took place. May I now ask him what achievement he has made within the last two years to increase the area under fruit gardens? Instead of the 70,000 acres under fruit

garden how many acres has he now got in the year 1939? Then Sardar Bahadur said that there were a number of difficulties which the fruit growers had to contend with. Sir William Roberts joined him in that contention. Then Mr. Amjid Ali too supported him and Mian Mush'iq Ahmad Gurmani also, with his weighty pronouncement, came to his support and corroborated his contention. They narrated the difficulties of the peasants as regards fruit growing and those difficulties still subsist and I ask my honourable friend to stand up and say what he has done to overcome these difficulties, to fulfil these needs and to carry out and redeem the promises given on that occasion. He said there was a lack of supply of seedlings, they were not adequate and they were not of the good quality; they were not healthy. The grafts were not good and they were not of the right type. What has he done to supply grafts of the right type and seedlings of the right type and also at lower prices? He also complained of the lack of proper fruit markets. What steps has my honourable friend taken to establish good, decent, sanitary fruit markets in the province? Has he made any improvement in the Lahore fruit market, in the Amritsar fruit market or any of the fruit markets of the province? Has he made any improvement at all? He sits mum. No improvement.

Further on, they rightly complained that no Kharaba was allowed to fruit growers. In case of other crops, kharaba is allowed. If wheat is damaged by natural calamity, Kharaba is allowed, if cotton is damaged, Kharaba is allowed, but if the whole of a mango crop is damaged by tala or some other natural calamity, no Kharaba is allowed. Then they complained of water rates and land revenue rates being charged twice a year while fruit growers have benefit accruing to them only once a year. Their complaint was justified and it is as much justified to-day

as it was two years ago when the honourable member sitting behind the Honourable Minister for development complained of these things. They urged the reduction of abiana on fruit gardens by 50 per cent and they said that no land revenue should be charged on fruit gardens during the first five years or so when the garden gives no benefit to the growers. They complain rightly and their demand was justified and genuine and this demand of the peasants still remains. When a fruit grower starts his fruit orchard, during the first four or five years or even ten years and in the case of mangoes fifteen or even twenty years, there is no benefit accruing to the fruit growers, why should the Government, from the very beginning, charge land revenue and why should they tax at the very initial stage when there is no return, no reward? There also was a demand for cold storage and refrigeration facilities for the preservation and transport of fruit from one place to another particularly in case of soft fruit. A writer emphasizing the necessity of cold storage says:—

"The chief function of cold storage is to equalize the distribution of seasonal products throughout the year. In other words cold storage acts like a reservoir receiving the surplus flow of goods when production exceeds demand and market glut is impending and giving over these goods when production has fallen off and a market scarcity is impending." So the function of cold storage is to ensure that there is an equitable distribution of fruit throughout the season and there is no rise in prices on account of scarcity at one time and fall in prices on account of glut in the market at another time. A second function of cold storage is transportation of perishable fruits in good condition to the consumer. United States of America which leads in agriculture has got 1,500 such storage houses and what has the Punjab Government done? Only one poor cold storage plant of a very small dimension exists at Lyallpur College and that even for making experiments. The honourable Minister on that occasion made the following promises and I to-day from my seat in this House remind him of these promises and ask him to let this House know what has he done to redeem those promises. He said as regards concession in water rates to fruit growers:—

"It should be made to all alike not only to those having a holding of over 50 acres. If favour is to be shown, it should be shown to smaller rather than big landlords."

What has he done to see that the smaller fruit grower also gets the concession which is enjoyed by those holding more than 50 acres of land under fruit gardens? Has he done anything? He also said—

"I shall bring to the notice of the Revenue Minister and, if need be, to the notice of the Cabinet the irrigation aspects of the question and the revenue aspect of the question and shall adopt necessary measures to see that reasonable demands of the agriculturists are fulfilled as regards irrigation and revenue aspects referred to during the discussion by friends from this side of the House."

Has he done anything to fulfil these promises? Has he been able to persuade his Government, his colleagues in the Cabinet, to reduce abiana on fruit gardens? Has he done anything to see that in the first four or five years fruit growers are not made liable to any land revenue charges? He frowns. This seems to pinch him. I can give to the House some quotations to show what Italy has done, what California has done, what Palestine has done, what France has done, to help fruit industry in their respective countries. But I think members of this honourable House will find enough material to study in the fruit journal issued by the Fruit Development Board of the province and in that journal they will find a leaflet called 'Fruit Industry in other Countries'. There is much useful matter in that leaflet. Our problem, Mr. Deputy Speaker is how to make agriculture a paying proposition.

Dewan Chaman Lal's Speech

Dewan Chaman Lal, Deputy leader (Opposition in course of his speech, delivered on 20th March, 1939, said:—

My honourable friends will recall the two little matters that I wish to mention. One is in regard to the fruit industry of the Punjab. A promise was, I believe, made by my honourable friend, the Premier, that he would allot a site for a market in Lahore and I do hope that my honourable friend will consider this particular matter when he deals with this portion of the budget. I am suggesting something constructive which my honourable friends, without entering into controversy, can achieve if they so desire to achieve. Make a survey of all orchards for bud selection work in order that the best trees may be marked out and be utilized for the purpose of budding plants for the growing orchards in the Punjab. There should be an adequate supply of water and there should be no assessment

twice a year but only once a year. I have seen the work of the Fruit Specialist at Lyallpur and I have nothing but praise for him. It is necessary that a separate department should be created for him.

S. B. Ujjal Singh's Speech

Representing the Government point of view, S. B. Ujjal Singh, Parliamentary Secretary, in the course of his speech delivered on 27th March, 1939, made the following observations:—

Sir, I come to the last point that is the fruit industry. My honourable friend from Hoshiarpur was right when he said that I was very much interested in this industry. Not only from the point of view that this is an industry which will give an additional income to the ordinary cultivator, but from the national health point of view, I consider, Government ought to encourage fruit industry in our province. This province is particularly suited for fruit culture; particularly our canal colonies, Kulu and other submountaneous parts of the Punjab are eminently suited for this purpose. We can really grow all varieties of fruit in the Punjab. Since the year 1928, when the special Fruit Department was opened, we have added considerably to the area under fruit trees. That was mostly due to the guidance, energy, zeal, I should say, missionary zeal, of the Fruit Specialist, Sardar Lal Singh. (Hear, hear) This goes to his credit, but I do admit that there has been difficulty in the further development of this industry. Total area under orchards in the Punjab is about 25 per cent of the total cultivated area.....I said, the difficulty was in regard to the supply of canal water and eventually the Irrigation Department agreed to this. They have also stated that they will be prepared to give extra water even to the small cultivator provided he is anxious to plant fruit trees on a small farm. That is a step in the right direction although there has been a great delay. But, as I have stated, the delay was due to the fact that the Chief Engineer and Irrigation authorities were not sure whether they could spare water for gardens. They have after careful consideration agreed to supply water for gardens.

Let us see how the experiment succeeds. If it succeeds, I think it will give a great impetus to the fruit industry. I quite admit that fruit industry has not been developed to the extent to which it was entitled, but now that the decision has been arrived at by the Irrigation Depart-

ment, I am sure that fruit gardens will grow in every canal colony and on every distributary and in every district. In spite of the fact that additional water was not available for new gardens, the fruit industry has been making rapid progress. For example, the chief defect was that the old gardens had very poor plants. The Fruit Department tried to provide new varieties of fruit plants to old gardens. The best varieties of malta plants are now available at a very low price. Previously malta plants were being sold at one rupee per plant. Now, blood red malta plants are available at six to eight annas per plant and I think that, in the course of next one or two year, plants will be available at four annas per plant. Another step in the right direction was the establishment of a Fruit Development Board. That Board has made very rapid progress. It has got 450 members on its register. (An honourable member: They are all big cultivators.) I am astonished at my honourable friend's ignorance. The doors of the Fruit Development Board are open to every fruit grower and I dare say that most of the members are small growers. It should be remembered that out of the 450 members or so there cannot be many big fruit growers. There are many small growers who are members of the Board. As I said, the doors of the Board are open to every fruit grower and it is making rapid progress.

Now that the canal water is made available, I am sure the activities of the Board will expand. Even now the Board is trying to set up a good fruit market in Lahore; this is engaging the attention of the Administrator. The difficulties are there and I think those difficulties will be overcome in due course and the Fruit Development Board will be able to carry on the work in the interest of fruit industry.

Dewan Chaman Lal: Are you thinking of setting up a separate department?

Sardar Bahadur Sardar Ujjal Singh: I am not aware of it. Perhaps my honourable friend the Minister for Agriculture may have to think of a separate fruit department if the fruit industry makes good progress and the activities of the fruit Development Board expand. For the present I do not know whether there is any proposal for a separate fruit department. As one of my honourable friends pointed out the fruit growers did point out to the Government that kharaba rules should also apply to fruit gardens and I

am glad to say that it is receiving the attention of the Canal Committee which is considering the whole question of **kharaba**. I am sure that this question of applying **kharaba** rules to fruit gardens will be very sympathetically considered. About land revenue also the Government has been approached by the fruit growers that land revenue ought to be charged once a year as fruits give crop once a year. I have not been able to understand why

land revenue is charged twice a year on fruit gardens, but the practice varies from place to place. In some places land revenue is charged once a year while in other places, perhaps due to some confusion during settlement, land revenue is charged twice a year on gardens; but that matter again is receiving the attention of the Government and I think the Government will come to the right decision very shortly.

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COMMERCIAL GLIMPSES

by

K. L. Kohli, M.A. L.S.G.D.

With a view to properly guide our readers in matter of their everyday purchases we have opened these columns as a permanent feature of the journal. Some of the clips of the season are :—

1. Glacier Products Make Headway:

—This year Messrs. Glacier Products, India, Pathankot, have added lime juice cordial, and tomato juice to their previous list of standard products—orange, lemon, lime and Mango Squashes and orange marmalade which had already captured Indian markets. With the efforts of their Sole-Agents M/s. Spencer & Co., Ltd., Glacier Products are finding ready market all over the country; and we now understand that arrangements are under afoot to export the same to Burma, Afghanistan, Cyprus island, etc. During the current year it is proposed to manufacture about 6,000 cases of all these products—about double the last year's production figure.

The preliminary experiments on the manufacture of citric acid are also towards completion, and it is now proposed to manufacture the same on commercial scale.

2. Radios for the Rural Areas :—

M/s. Gardeners Juices (India) of Lyallpur who have already made a mark all over the country as importers in Canning Machinery have opened a special Radio Department as well. Their Lark Radio set which has been in the market for the

last over two years compare very favourably, with the very best in the market. The distinctive feature of the Lark Radio sets is that the same can work both on 6 volt car Battery and Electric mains. Those who have so far been hesitating to purchase a wireless set for uncertainty of their stay at an electrical or non-electrical place, will find this set a decent buy. This model is housed in a most attractive cabinet and has fine performance on all hands especially on short wave. A large number of these sets have been supplied recently to the Rural Reconstruction Department.

3. Blood Red Malta Plants :—

For a number of years, Gujranwala is known for Blood Red Malta fruits. One of the progressive houses which has won reputation for clean dealings, is Popular Nurseries & Fruit Farm, Gujranwala. In a short span of about fifteen years, Popular Nurseries have established business relations to the entire satisfaction of patrons, all over India. The Nursery is being managed by experienced horticulturists and consequently is on the approved list of the Agricultural Department, Punjab and others.

4. Malda Mangoes :—City of Malda (Bengal) is known throughout the length and breadth of India for a number of delicious varieties of mango, rich with vitamin values. To make them available to the fruit lovers all over India Mr.

M. B. Sinha, B.Sc., of Capai-Nawabgunj, (Malda) has opened a special parcel department. Mr. Sinha has assured us that he will supply the finest malda mangoes to the readers of the journal and that the same would be packed in sufficiently strong wooden boxes which are so designed as to maintain ventilation to keep the fruits in good condition for a considerable time.

5. Benarsi Langra Mangoes :—The city of Benares has also a prominent place in the fruit map of the country. Famous Langra mangoes, Safeda and Dasehri mangoes have a wide demand on the table. To meet the growing demand M/s. S. K. Sharma & Co. of Benares who claim to be specialists in mangoes have also opened a special mail order departments at Benares City and Top Darwaza Lucknow to popularise these choicest varieties of mangoes.

6. Darbhanga on the Fruit Map :—Darbhangha (Bihar) has been enjoying a conspicuous position in the fruit nursery business. We have recently come across the literature supplied by M/s. Nawab

Garden, Darbhanga and we are glad to note that this house of plants is being run on an up-to-date line under experienced management. The firm is reported to be liberally patronized by growers and government departments of the said province.

7. Spraying Specialists :—Messrs. Standard Furniture Co., Ltd., Kallai, Malabar, manufacturers of high class sprayers and other gardening equipments which is being managed by Rao Sahib V. K. Menon, B.A. and V. S. Natraja Mudalyar have been taking very keen interest in popularising gardening equipments particularly sprayers of all types. The importance of spraying has been growingly recognised for the last quarter of a century. In the year 1914 when the Great War was declared, the Agricultural Department in the Madras Presidency felt difficulty in securing the required supply of sprayers for preventing insect pests. The standard Furniture Company began at that time the manufacture of the sprayers and it has continued to do so ever since with great success.

JUST OUT !

JUST OUT !!

JUST OUT !!!

An illuminating and comprehensive Bulletin dealing with the Fruit Industry of Kashmir, has just been brought out by the Punjab Fruit Development Board. This Bulletin is based on the observations made by the Fruit Specialist Punjab, and the Assistant Fruit Specialist during their visit to Kashmir State.

Each Bulletin is priced at annas two & nine pies only.
THE PUNJAB FRUIT DEVELOPMENT BOARD,
LYALLPUR.

The PUNJAB FRUIT JOURNAL

Vol. IV]

Lyallpur, July, 1940

[No. 15

A View of the Past...

A view of the past is never without a peculiar charm of its own. It provides a vision for the future. There have been uncertainties and we have bravely gone through them. It is our pride to-day that we hold the success in our hands. The fruit growing public in India has now a full consciousness of the utility of the Punjab Fruit Journal and is extending its co-operation to our efforts with a willingness that speaks of a definite future.

In many shapes we have deserved and won the appreciation of our readers. Innumerable letters have been received in the office of the Board bringing expressions of confidence in our guidance from places,—besides all over the Punjab,—such as Ceylon, Burma, Bombay and Madras. The reach of our influence now penetrates even the remotest corners of the country.

There is a persistently growing realization, as is evident from the correspondence received in the office that no issue published so far, since the first issue of January, 1937, is without an

indispensible value of its own. Consequently, there has been a constant demand for "all the previous issues" to "complete the file."

Many readers have written that the despatch of the journal "may never be discontinued" and they have sent in subscriptions for two or three years in advance. The indispensability of the "Punjab Fruit Journal" for the fruit growing public is more than manifest from the fact that certain readers who stopped subscribing somewhere in 1938, realized in 1939 or 1940 that they had "made a mistake" and have thought it advisable to secure the missing numbers and to continue subscribing for the future, without break.

Our Special Numbers have always evinced a special interest. "The Mango Number" (July 1939 issue) has already gone out of stock and the proposal is under consideration that a second edition should be brought forth, for the demand is still so persistent. Several gratifying felicitations have been intimated, describing the Number as a

"good publication." The recently published 1940 Annual Number has been read throughout, "with interest" and the get-up of the Number has been described as "excellent."

The joy and encouragement one receives from a well-deserved appreciation, is great. We hope to be excused for reproducing a few lines, regarding the value of the Journal, from the pen of so competent a judge as Dr. W.

Burns, Agricultural Commissioner with the Government of India: ".....It forms a permanent record of observations and experience; it is a medium for the dissemination of results of scientific research; it is a forum for the exchange of views; it keeps its readers in touch with what is going on in other countries, it can be useful as regards market information...."

M. S. NIRMAL



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Extra Water Sanctioned for Gardens

By

K. L. Kohli, M.A., L.S.G.D.,
Assistant Secretary, Punjab P. C.

Fruit Development Board

There is a heartening news from Simla at last. The 'gods of water' have decided to come to the rescue of the hard pressed provincial fruit industry and have been pleased to announce the grant of extra canal water for the development of fruit industry on the lines already agreed upon by the Chief Engineers, Irrigation Dept., with the deputation of the Punjab Fruit Development Board which waited on the Hon'ble Minister for Revenue on 17th March, 1939.

Here is yet another success for the Punjab Fruit Development Board and its Executive. Past experience had amply shown that individual representations made by leading fruit growers or by mofussil fruit growers associations had proved of no avail. On the other hand it was becoming increasingly evident that it would not be possible to pursue gardening in the canal colonies, unless some satisfactory arrangements were arrived at for providing extra supplies of water. Extension programme of most of the orchards was at standstill. Under such heavy odds the Board undertook to fight the cause of thousands of silent fruit growers.

Although this vexed question had a long and dismal chronicle, its importance was brought out in full prominence at the inaugural annual general meeting of the Board held on 23rd April, 1936, when after a series of speeches, full of resentment at the indifference of the Canal authorities to the needs of the fruit growers, a strong representative Canal Sub-Committee was constituted to pursue the matter in and outside the legislature. It is needless to recount in detail the relentless agitation carried on by the said committee for years together and the disappointments it met in this uphill task. Details of the case as embodied in the presidential address delivered at the last annual meeting of the Board needs no fresh elucidation.

'If winter comes can spring be far behind?' And we now offer our felicitations to members of the Executive Committee of the Board, especially to its President the Hon'ble Ch. Sir Shahab-ud-Din and S. S. Lal Singh, Honorary Secretary for securing these highly creditable concessions. The part played by members of the "Assembly members

Fruit Group" especially its leader S.B. Ujjal Singh in bringing this matter time and again on the floor of the Assembly is no less conspicuous. The Board also feels highly indebted to our popular and enthusiastic Director of Agriculture, Mr. H. R. Stewart, for the bold stand he has been taking to represent the feelings of the fruit growing community year after year in right circles and in the right manner.

But looking into the Government orders, just issued, it is evident that the irrigation department too had difficulties. The practical aspect of this knotty problem was not without difficulties, such as adjusting claims of big fruit growers versus small fruit growers and other existing vested interests, in creating new outlets or revising existing 'Wara Bandis' to the detriment of existing zamindars and host of other such issues. The Government orders which have been just issued, embody an equitable working basis for the problem which at one time seemed insurmountable. The fruit growing community in general and the members of the Fruit Development Board in particular take this opportunity to express their sense of gratitude at this decision, to the Hon'ble Premier, the Hon'ble Revenue Minister and the Chief Engineers Canals.

We welcome the decision and wish the same a fair trial, although it is possible that experience may show that the concession of double wari is not ade-

quate to maintain gardens in efficient conditions in the extremely hot climatic conditions of the canal colonies and that the minimum water to be allowed should be three times the normal amount of water i.e. treble wari as was the practice, formerly. In any case, the fruit growers should exercise every possible economy in the use of water to see if this concession would not be enough to maintain their orchards in efficient conditions and we shall give a few hints on the conservation of moisture in the orchards for the benefit of the readers. The summary of concessions allowed by the irrigation department vide circular No: 1447 S. Rev. addressed to the Superintending Engineers by the Under Secretary, Irrigation Department is as under:—

1. The Government have decided that on a Branch Canal the maximum area of fruit orchards which may receive this extra supply is to be limited to $\frac{1}{2}\%$ of the culturable Commanded Area of the Branch, but on a minor or distributory, this limit is to be fixed at 2% for any one channel. In this way the savings on some channels will balance the excess over $\frac{1}{2}\%$ culturable commanded area.

2. The orchard areas will receive double the supply which is given for ordinary cultivated lands.

3. It has been decided that this extra supply of water for orchards shall be divided equally among the big and small owners.

By definition the big owner is a man who wishes to plant up an orchard of 18 acres or more and a small owner is the man who wants to put down an orchard of less than 18 acres.

To ensure the practice of these measures, half the extra supplies available on any distributary for growing Fruit Orchards will be reserved for each of the two categories, and water reserved for one category may be allotted for orchards of the other category with the sanction of Government, which will not be granted unless the circumstances are exceptional.

4. It is considered that the supply of an outlet cannot be increased for an addition of less than 18 acres Culturable Commanded Area. So an extra supply will be authorised in an outlet Chak only when the total area of the small owners, for which application is made for extra supply, works up to 18 acres or more. So long as it is less than 18 acres, extra supply will not be authorised; but if the area is less than 18 acres and the owners obtain in writing the consent of the shareholders of the Chak to the extra supply being given from the existing supply of the Chak, then the Warabandi can be revised and extra Wari allotted for the orchard area without increasing the discharge of the outlet.

5. The essential condition is that Abiana shall be charged in accordance with the class V Schedule of occupiers'

rates for orchards for the whole area in each crop season for which extra supply is sanctioned irrespective whether the whole of the area is actually irrigated or not. Also, abiana shall have to be paid in the non-fruit bearing stage.

6. Big owners, even though commanding substantial means, will generally not be able to plant more than a square or so in a year. For those applying for extra supply for a larger area than a square, extra supply shall be given on the basis of one square being planted each year and the outlet will be adjusted annually accordingly.

7. If satisfactory arrangements are not made by an owner to the satisfaction of the Director of Agriculture the extra supply will be stopped on the recommendation of the Director of Agriculture after giving 6 months' notice.

8. Where possible, a separate outlet shall be given for planting an orchard, the minimum discharge for the purpose being half a cusec.

Members of the Board are advised to expedite their applications for enhanced supply for gardens to the Honorary Secretary of the Board for forwarding the same to proper authorities. The applicants should state the following particulars in their applications:

- (a) Area of garden which is already receiving extra supply of water.

(b) Area of garden which is not yet granted extra supply of water.

(c) In each case (a) and (b) above please also mention the kinds of fruit trees planted and their number and also the year of planting the garden.

(d) Area proposed to be planted.

(e) Name of the Chak and the distributary by which the garden in question is irrigated.

Information on the last point i.e. name of the distributary is particularly necessary.

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Production of Citrus Oil as a Home Industry

By

S. S. Lal Singh, B.Sc. (Hons.), M.Sc.
(Calif.),

Fruit Specialist, Punjab
and

Dr. Girdhari Lal, Ph.D. (Lond.), D.I.C.,
Assistant Fruit Biochemist,

Fruit Section, Lyallpur.

A very interesting investigation on the production of citrus oil as a home industry has recently been undertaken by Zdenka Samisch at Agricultural Research Station Rehovot, Division of Horticulture, Fruit Products Laboratories in Palestine. The method of extracting the oil from peels of citrus fruits like oranges, lemons and grape-fruit, the principles involved in extracting the oil, its cost of production as given by the above investigator are briefly discussed below. Some observations on the production of citrus oils as carried out at the Fruit Products Laboratories, Lyallpur are also recorded.—Ed.

Essential oil occurs in all citrus species in special glands which are found in the leaves, blossoms and fruits of citrus trees. The outer yellow layer of the rind of the fruit, the flavedo, is very rich in these glands and is, therefore, the main source of citrus oil production.

Extraction of Oil.—The extraction of oil from the peel of citrus fruits may be affected by various means such as distilling, grating, pricking, pressing, etc. After liberating the oil in this manner, it is collected either by means of sponges or by means of water flowing over the surface of the fruit. Different types of machinery for industrial production are however

available, but these do not come into consideration for home production because of their higher initial investment and large scale production for which they are meant. The method which is best suited for home production, consists in squeezing the emptied peel and absorption of the squeezed oil by means of sponges. The original primitive method which was first developed in Southern Italy and Sicily requires no tools whatsoever, and involves the pressing and squeezing of the peel in one hand against a sponge held in the other hand. This method is very tiresome and time-consuming and has been lately modified by the introduction of a small hand press.

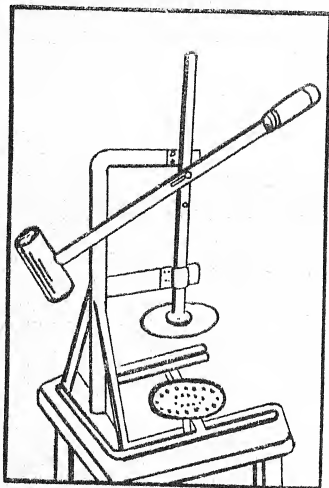


FIG 1.

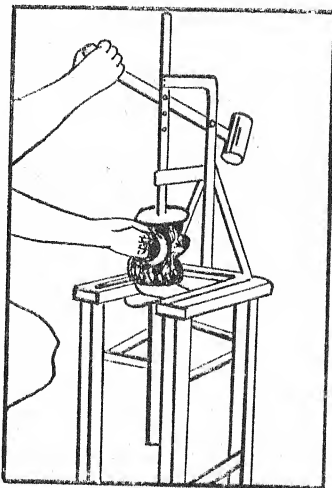


FIG 2

HAND-WORKED PRESS FOR EXTRACTION OF CITRUS OILS.

Hand worked press for oil extraction.

—Figures 1 and 2 illustrate the simplest type of hand-press which has been used in experiments in Palestine. The upper plate, which is removed by means of counter-poised lever, is pressed against a second stationary and perforated plate. A funnel is placed below the perforated plate and the extract is collected in a suitable container. All metal parts like the two plates, supporting rods and funnel are made of non-corrosive metal such as brass, tinned copper or aluminium. In order to prevent losses of oil in pressing, a suitable bag, as shown in Fig. 2 is placed between the two plates. This bag is made of felt or strong linen which is lined with a thin layer of finepored

sponges. After the sponges are carefully sewn to the bag, the latter is attached to both plates in such a manner that the halved peel can be introduced into the bag when the lever is lifted, and squeezed within the bag when the press is closed. A large sponge is also attached to each of the two plates between the bag and the plate.

The finer pores of the sponges have been found to yield higher quantities of oil if the sponges full of oil extract are pressed at frequent intervals. In order to preserve the sponge for a longer time, a small book press is advisable for squeezing the oil extract from the sponges. They are well washed after day's work to keep them clean and sweet-smelling.

Method of Extraction.—After a good deal of experimentation on the type of fruit, its pre-treatment, the effect of pre-treatment upon yield, method of squeezing, etc., the following method for the extraction of oil has been recommended.

(i) **Material.**—Third grade 'cull, citrus fruits are cut crosswise and the fruit pulp is removed by means of a special spoon-like knife, and the halves of fruits thus obtained are used for extraction of oil.

Note.—The juice of the fruit may be extracted either before the separation of peel and pulp (by means of a small hand-worked rosin or burring machine), or after depulping, the juice can be extracted through a hand worked meat-mincing type of press. The juice can be used in its natural condition or permitted to ferment for vinegar, wine, etc. Under Indian conditions, however, the juice can be best utilized for the preparation of squash or cordial, beverages which are in fair demand in this country. It is not the purpose of this publication to discuss citrus products other than oil, but attention should be called to the fact that in a home industry of this nature other simple products utilizing the residue could be easily produced. For instance the peel after oil extraction could be used as an animal food or as a marmalade stock.

(ii) **Pre-Treatment of Peels before Squeezing.**—Halves of the fruit as obtained under (i) above, are stored overnight (may also be used immediately after extraction of oil) and soaked in water for $\frac{3}{4}$ hour.

Note.—It has been found by experimentation that the soaking of peels in water before squeezing in the press is absolutely essential. This treatment imparts the necessary turgidity to the peel which results in relatively higher yield of oil than when the peel as such is used for extraction. Even the peel when stored as such over a period of one week (it wilts sufficiently during that period) when soaked in water for about $1\frac{1}{2}$ hour, yields the normal amount of oil.

(iii) **Method of Squeezing.**—The peel after soaking is turned 4 to 5 times

round its horizontal axis between repeated pressing.

Note.—The mechanism involved in oil extraction by the press shown in Figs. 1 and 2 consists of bending and the squeezing of the tissues rather than mere pressing. The application of unnecessary force will only result in the squeezing out of additional sap rather than oil. Since the oil is released primarily in the vicinity of the bend, the peel has to be turned several times around its horizontal axis between repeated pressings in order to bend a maximum proportion of the tissue. At the relatively low price of fruit, more than 4 to 5 squeezes may not pay unless the apparatus and technique could be sufficiently improved to permit a more rapid squeezing.

(iv) **Collecting of Extract & Separation of Oil.**—The extracted liquid is collected in a non-corrosive vessel through a funnel (as already mentioned). This solution contains oil mixed with aqueous solution. To separate these, the mixture is permitted to stand for a few minutes and the oil which thus rises to the surface is skimmed off. It is passed through dry filter papers before bottling.

Yield of Oil.—100 fruits of the citrus species given below gave the following yield:—

Species	Yield in grams of oil per 100 fruit
Orange (Shamouti)	54
Lemon (Eureka)	40
Grape Fruit (Marsh)	67

Cost of Production.—In the case of oranges the author has given the following data in regard to its cost of production:—

"On an average 600 oranges could be handled by one person daily. It took approximately four hours time to cut, depulp and soak the oranges and an

equal amount of time to squeeze them. At 60 c.c. oil per 100 oranges we obtain a daily out-put of about 360 C.C. or some 300 grams of oil. At the above, it gives a daily gross income of some 3 shillings and 7 pence (Rs. 2[6]-). From this, we have to deduct the value of the fruit and the capital invested. The value of the fruit will depend upon the local market prices for culls and the distance the fruit has to be hauled from the grove. The cost will also be reduced by the subsequent utilization of the fruit for other products."

In the above calculations, the price of orange oil has been assumed to be about 12 shillings per kilo-gram (1,000 grams) of oil.

Note.—In India, of course, the orange peels which are now thrown away in thousands can be used for oil extraction which will mean practically no cost for the raw material.

Investment.—The investment required for such home production is extremely small; two labourers working on one machine will require:—

1. One Press for squeezing.
2. Bag and sponge.
3. One knife for halving and one for depulping.
4. 2 funnels, filter papers, measuring flask.
5. Storage containers (bottles or drums.)

This is estimated to cost about Rs. 25/- only.

Note.—Some preliminary experiments on the extraction of essential oils from orange (Malta) and lemon (European Variety), have been conducted at the Fruit Products Laboratories, Lyallpur, by a wooden press with the aid of sponges—working principles of the press were almost similar to that of the press reported in this article, but it was of much simpler design. Work in this direction is still in progress but due to its being still in preliminary stages, enough data have not been collected to put forth definite recommendations. It is, however, hoped that some information on this subject under our local conditions will soon be available.

It is hoped that the present review of the work done in Palestine will serve useful purpose.

Note.—The above article is extracted from HADAR (Vol. XIII, No. 3), the well-known magazine of Palestine, devoted exclusively to the Citrus Fruit Industry.

To Subscribers of the Punjab Fruit Journal

Most of the subscribers of the Punjab Fruit Journal started subscribing to the journal from October 1939. With the supply of this issue their annual subscription expires. They are requested to remit Rupees three by return to renew their subscriptions during this quarter, failing which the next issue of the journal will be sent per V. P. P. of Rs. 3/8/-.

Ringling and Root-pruning of non-bearing Sangtra trees in the Punjab

By

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Introduction.—Of all citrus fruits, the phenomenon of non-bearing is most peculiar to Sangtra trees. The non-bearing may be complete when little or no crop is produced and it may be partial when only poor out-turns are received. Sometimes, however, the conditions may be such as to promote an unusual delay in the commencement of first bearing, which is often termed as the non-bearing of young and over-vegetative trees. In all such cases, a number of factors may be associated with the malady and may be operative, either singly or jointly in so changing the carbohydrate-nitrogen ratio of the tree as to cause non-bearing.

For increased flower and fruit production such cultural practices as ringling and root-pruning have often been employed with the desired results, but the adoption of these measures in commercial orchard practice has not been considered advantageous beyond their indulgence as "emergency measures." Nor have these measures been equally effective with different kinds of fruits. Ringling is sometimes practised commercially in grape culture but the purposes in view have

always been other than increased flower-bud formation.

Root-pruning, as an orchard practice, is carried out in certain parts of India, more with the idea of regulating the time of bearing than to induce fruitfulness. This measure, by reducing the intake of water and mineral nutrients, checks growth and may cause accumulation of carbohydrates in the top followed by increased fruit-bud formation. However, the operation requires to be practised with extreme moderation and in such cases only where the trees are prone to make excessive vegetative growth.

Thus ringling and root-pruning may prove equally effective in inducing fruitfulness under different conditions but the efficacy of the one method over the other under a given set of conditions must always be determined by experimentation. It was particularly with this viewpoint that a field experiment was laid out on partially non-bearing sangtra trees growing at Dr. Chemas' Fruit Farm, Montgomery, Punjab.

Material.—At the time of layout of the experiment in January, 1938, the

trees were nearly sixteen years old and in vigour they may be termed as just normal. These trees had never given an economic crop throughout their orchard life, and were retained so long in the hope of getting increased out-turns some day. All the trees under experiment apparently belonged to one and the same strain and were purchased from the same source.

Layout.—A set of trees of uniform vigour as determined by "head-volume" was selected for this investigation. The layout was of the randomised-block type and in all, six replicates were provided. An idea of the uniformity of size of the trees before starting the experiment may be had by examining the data in table No. 1 which shows clearly that the plants under each treatment were very nearly identical and uniform in vigour or size.

Table 1.—Showing the mean "head volume" in cubic feet of Sangtra trees at the commencement of ringing and root-pruning treatments.

	Control.	Ringing.	Root-Pruning	General mean	S. E.	Significant difference for $P=0.05$
Mean head volume in cubic feet.	2916	3125	3015	3019	255	803

The figures show that the highest mean difference between the trees under control and ringing treatments viz., 209 cubic feet is less than the standard error and far less than the significant difference of 803 cubic feet. In other words,

the trees selected for different treatments were quite uniform.

Experimental methods.—Both the ringing and root-pruning treatments were given about six weeks before the time of flowering and are described as follows:—

Ringing.—A complete ring of bark of about 0.5 c.m. width was removed from the trunk of the trees by means of a sharp knife without injuring the wood. The wounds were covered with waxed tape to facilitate healing.

Root-pruning.—Two circular marks of one foot and four feet radius each, were made around the trunk of trees under root-pruning operation. The soil between two marks, having a width of three feet, was dug out leaving untouched a block of earth of one foot radius around the trunk of each tree. The digging was done to a depth of nine inches and all fibrous roots including those below the thickness of lead pencil were removed. The trees were left exposed in this condition for a period of ten days after which the pits were covered with dug-out earth with which farm-yard manure was mixed at the rate of one maund per tree.

A similar dose of farm-yard manure per tree was applied in case of trees under ringing treatment and those that were left untreated. The experiment was repeated in 1939.

Results and Conclusions.—Data on the yield of individual trees was collected for the years 1938 and 1939 and analysed statistically as shown in table No. 2.

Table No. 2.—Showing the yield (mean number of fruits per tree) of Sangtra trees subsequent to ringing and root-pruning treatments.

Year.	Treatments.			General Mean	S. E.	Significant difference for $P=0.5$
	Ringing.	Root-pruning.	Control.			
1938	180	47	58	95	18	56
1939	68	12	15	30	10	32

The results show that, of the two methods employed to induce fruitfulness, ringing alone produced encouraging results. By this method, the yield of trees was increased to three times the yield of control trees in 1938 and to nearly four times and a half the yield of same trees in 1939. The root-pruned trees, on the other hand, have shown practically no response to the treatment as compared with the control trees. This may probably be due to the fact that the operation was light as the trees are generally spaded fairly deep in that orchard or for the matter of that in almost every orchard in the Punjab at least once a year at the time of manuring.

From these results the efficacy of ringing, as a means to induce fruitfulness, has been clearly demonstrated as the differences in the average yield of fruit in favour of ringing are highly significant for both the years—1938 being a year of normal citrus crop and 1939 being a year of poor crop at Fruit Farm Montgomery. It may, however, be argued that the average yield of ringed trees even in a normal year of citrus crop at that Farm

was far from an economic return, but it must be noted that the operation itself could touch only the potential bearing capacity of the strain and no further. In other words, the sangtra variety under experiment could not, perhaps, bear more than was made possible by ringing under the conditions prevailing. If, however, nothing had been wrong with the variety itself and the health of the plants, the bearing might have been increased to yield a normal economic crop.

Acknowledgment.—The author wishes to express gratefully, his thanks to Mr. B. S. Mahngar, who assisted in the collection and compilation of results reported in this paper.

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Cashew Nut Cultivation

By

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Fruit Section, Lyallpur.

We have received several enquiries asking wherefrom the cashew nut, (*Anacardium Occidentale*) known locally as "Khaja" comes and how it is cultivated and what are its climatic requirements. The cultivation of this fruit is almost unknown in the Punjab as all of the fruit is imported from outside the Province. It is sold in very large quantities throughout the Province and is either consumed as such or used in confectionaries. A short article on its cultivation would not, therefore, be devoid of interest to our readers.

According to the views held by Popenoe, the cashew is indigenous to America, whence it was introduced into Asia and Africa by early Portuguese travellers. At present it grows in many parts of the world like the mainland of Tropical America from Mexico to Peru and Brazil, West Indies, African Coasts and in India along the coasts in South Western districts of Bombay Presidency, etc.

It is an ever-green tree attaining a height of as much as 30 ft. or above in its natural habitat. The leaves are oblong, oval to oblong ovate in form, rounded at the apex. They vary considerably in size from about 4 to 8 inches in length and 2 to 3 inches in breadth. Like

the mango the flowers are produced in panicles which originate from the terminal buds of the shoots.

The cashew thrives best along the sea coasts where hot and humid conditions prevail throughout the greater portion of the year. It is rarely grown at elevation higher than 3,000 ft. as a higher elevation than this is considered too cool for the tree. The region where it grows in Bombay Presidency is subject to heavy rainfall; and annual precipitation of 90 to 150 inches is experienced during Monsoon months of June to September. It is very much susceptible to frost and would fail to establish itself at places where frost is common, although other conditions may be quite congenial to its cultivation. The cashew is not fastidious in its soil requirements and can grow successfully on almost any type of soil ranging from sandy to stony, although it prefers light sandy soils which are most suited to its needs.

In India, at places where it is found, it grows wild and no attempt has so far been made to establish it in regular plantations. Sometimes, however, it is grown on the borders of the cultivated fields as a hedge crop. Although cashew can be shield budded but the most common and popular method of its propagation is

through seeds which are sown about twenty feet apart during the month of June. The plants are watered during the first year of planting and thereafter no care is taken of them. The tree begins to bear from third or fourth year after the seeds are sown and continues to bear till the age of about fifteen after which it becomes usually unproductive and dies as a result of large quantity of gummy substance exuding from the tree at this stage.

In Konkan Tract of Bombay Presidency it flowers in January or February and the fruit ripens in April or May. After the formation and ripening of nuts, a strange phenomenon takes place which is beautifully described by W. J. Jenkins. "The stalk or peduncle of each nut gradually swells and assumes a fleshy, turgid appearance somewhat resembling an over-ripe apple. The cashew 'apple' matures to be a bright and yellow colour, a striking contrast to the dark olive green nut which projects as a kidney-shaped excrescence from the apex of the rounded and the pulpy stalk." The nuts along with the apples are gathered together and later on when the nuts are to be husked, these (i.e. nuts and the apples) are separated from one another. On an average about 100 to 150 lbs. of apples and about 25 lbs. of unhusked nuts are obtained from a mature tree. Twenty-five pounds of unhusked nuts yield about 8 pounds of kernel which is marketed for human consumption.

In India and most of the other places, where cashew is grown, the nut is more extensively used and the apple thrown away while in Brazil apple is also consumed and made use of in the form of a

beverage or wine and sometimes jams or sweetmeats are made out of the fruit.

The nuts are used for decorative and flavouring purposes in baking and confectionary trade and at some places are used as such or liked as salted nuts.

The kernel is extracted from the nut in the following way before it is fit for human consumption. The nuts are roasted over a char-coal fire in earthen pots perforated at the bottom and thus substances like cardol and anacardic acid, contained in the husk, which are injurious and burn the mouth and lips if consumed without roasting, are given off. The nuts are then cracked and the kernel extracted by hands. This work in India is almost invariably carried out by women who, by long experience, are quite conversant with this practice, which requires proper amount of roasting (so that the kernel may not become brittle) and skill in cracking the nuts so as to avoid breaking the kernel into pieces.

It is quite interesting to mention that about 15,000 tons of raw nuts are annually imported into India and exported to U.S.A. and other countries after these are husked.

While it cannot be said with certainty how this fruit would fare in the Punjab as at times the province is subject to severe frosts, it would be worthwhile trying it in the submountaneous districts where hot and humid conditions prevail during the summer months.

Seed Sowing of Annuals

By

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The interest in floriculture is increasing day by day with the ever-increasing inclination among the people living in towns, to live in the open by owning or building bungalows of their own. It is natural that they should beautify their surroundings by growing ornamental flowering plants, of the list of which the annuals form a formidable part. The initial success of these plants depends upon the care exercised in sowing the seeds. If a higher percentage of seeds can be made to germinate one can realise more value out of the sum expended on the purchase of such seeds.

There are certain general conditions necessary to ensure a higher percentage in germination which are discussed below:—

Age and Storage of Seeds.—It is a well-known fact that certain seeds germinate equally well when some years old but the best rule for the beginner to remember regarding the common annuals is that the seed should be as fresh as possible. If seeds are to be gathered from one's own compound beds—which practice is recommended to a certain extent to effect saving in the annual seed bill—the seed so gathered should be stored in some glass bottles or in such empty tins

whose lids may be tight enough to make them fairly air-tight. Immature seeds, however, should not be gathered. In case the seeds are to be ordered from a seed selling firm the order may be placed only at the time when seeds are required for sowing purposes, otherwise if ordered too much ahead of time the seeds are liable to deteriorate under our hot climatic conditions.

SOWING OF SEEDS

The germination of a seed depends upon factors like viability (ability of seed to germinate) heat and moisture. All these conditions can be favourably brought about in the common plant growing media called soil.

Soil.—The soil meant for sowing seed either in pots or beds, must be thoroughly pulverized. It should contain a good proportion of sand and well rotted organic matter—preferably leaf mould or even farmyard manure. Sand and organic matter are added as soil conditioners and much less as plant food materials. Soil prepared thus holds moisture well and takes longer time to dry out and does not become so hard as to prevent the seedlings from pushing their tips through the comparatively hard crust. The above

mentioned composition of soil is more important with the small seeds of annuals rather than with large seeded kinds such as sweet peas. The newly sprouted young seedlings hardly require any great quantity of food from the soil; so that the value of organic matter and farm yard manure is minimised on that account. If, on the other hand, a proper care is not exercised in watering the young seedlings the organic matter or humus may even prove detrimental in hastening a disease known as "dumping off."

INSTRUCTIONS FOR SOWING SEEDS

1. The soil should be thoroughly pulverized, the bed properly made, levelled or the soil properly potted and firmed therein if the pot is to be used for seed sowing.

2. Seeds may be sown broadcast in pots and in rows in beds.

3. Deep sowing of seeds should be avoided because proper depth is one of the factors greatly influencing the germination. The best criterion is to sift enough soil on the sown seed so as to cover it with soil which is as deep as about double the thickness of the seed itself. Small or thin seeds, therefore, will require very little depth of sowing as compared with thick or big seeds, which should be sown deeper.

4. Avoid thick or close sowing as thickly growing seedlings will be difficult to transplant.

5. Watering must be done carefully as careless watering will wash the soil off the seeds. Special fine spray 'roses' are available in the market and these should be used for watering the pots or beds after seed sowing.

6. Do not overwater as it encourages 'Damping off' or do not under-water as it allows the soil to dry out and kill the seedlings.

If seeds have been sown in pots the best way to water these pots is to place them in a tank or trough of water. The level of water should be about an inch or two below the top of the pot. The water will thus thoroughly soak in. The necessity of watering with a water-can may be eliminated if this is practised once a day.

7. Keep such pots in shade or partial shade. Seed beds should also be located in such a place.

FILLING POTS (OR POTTING) FOR SEED SOWING

As only a small quantity of seedlings are required for planting in home gardens it will be better to sow seeds in pots (gamlas) rather than sow in beds. Filling the pots properly with soil is an art in itself and some hints, regarding this, will be quite in order here. Seedlings grown in beds are exposed to adverse weather conditions while those growing in pots can be removed to sheltered positions (such as in verandah) whenever necessary.

The hole at the bottom of a pot is meant for drainage of excess water. Special care must, therefore, be exercised to see that this hole is not plugged. To keep it open and effective a piece of broken pottery be placed over the hole with the curvature downwards or facing the hole. Over this, burnt cinders of coal may be put to a depth of about 1" or 2" to further ensure the drainage. Put the sifted soil above this and fill the pot. Settle the soil in the pot by giving a couple of smart pounds to pot by

lifting it a little and then striking against the ground. The soil is thus reasonably firmed, seeds sown and covered with soil to proper depth finally leaving about $\frac{3}{4}$ " to 1" of room between the surface of the soil and the top of the pot. This is done to accommodate proper amount of water in the pot at each watering.

Additional precaution of placing the pots over bricks during rainy season may be taken to ensure proper drainage during excessive rainy days.

Important hints and precautions that lead to success have been included in this note. It is only by actual practice with these operations that one learns the way to greater success.

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THE PUNJAB FRUIT DEVELOPMENT BOARD,
LYALLPUR.

Litchi and its Cultivation

By

B. S. Mahngar, M.Sc. (Idaho),

Fruit Section, Lyallpur.

In India litchi was first introduced in Bengal in the 18th Century and is now found in Bengal, Behar, United Provinces and to some extent in the Punjab in sub-montane districts like Gurdaspur. The most important litchi growing districts in India are, Chittagong (Bengal) Muzaffarpur (Behar) and Lucknow and Saharanpur (U.P.).

The fruit is also grown in Madagascar, Burma and Hawaii Islands. Its original home is said to be in China. Recently its cultivation has spread over many other parts of the world such as U.S.A., Brazil, Jamaica, etc.

The litchi tree is more or less ornamental in nature. It grows 25—40 feet in height and has a well-shaped, broad and round topped crown giving it a majestic appearance. The foliage is abundant and glossy green. The trees blossom in the month of February. The fruit is produced in loose clusters of 2-3 to 20 or more and ripens in the months of May, June.

The litchi can be grown successfully in tropical and sub-tropical regions where the soil is deep and moist and frosts very rare. Dry climate, severe winters and frosts are injurious to the plants in the early stages of growth. Young plants should, therefore, be protected carefully, in winter, for the

first few years. Mature trees can, however, withstand the onslaught of frost successfully. Soft rich soils of alluvial origin coupled with abundant rainfall during summer are very desirable for its cultivation. In short, for successful growing of litchi the following important points should be borne in mind.

1. Absence of heavy frosts.
2. Deep rich alluvial loam soil.
3. Moderately hot and moist climate.
4. Abundance of soil moisture.

Young litchi plants are planted in the field 30—40 feet apart. Pits are dug in the soil to a depth of $2\frac{1}{2}$ to 3 feet and filled with soil which has previously been mixed with well-rotten farm yard manure or leaf mould and silt. The pits are then watered to bring about proper settling of the soil in them.

Transplanting is usually done after 4 to 5 days of watering, when the soil is in proper 'wattar'.

During the early stages, after transplanting, the plants require frequent watering, about twice a week when rains are scarce. When the trees are well established, the number of irrigations may be reduced.

lifting it a little and then striking against the ground. The soil is thus reasonably firmed, seeds sown and covered with soil to proper depth finally leaving about $\frac{3}{4}$ " to 1" of room between the surface of the soil and the top of the pot. This is done to accommodate proper amount of water in the pot at each watering.

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An illuminating and comprehensive Bulletin dealing with the Fruit Industry of Kashmir, has just been brought out by the Punjab Fruit Development Board. This Bulletin is based on the observations made by the Fruit Specialist Punjab, and the Assistant Fruit Specialist during their visit to Kashmir State.

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THE PUNJAB FRUIT DEVELOPMENT BOARD,
LYALLPUR.

Litchi and its Cultivation

By

B. S. Mahngar, M.Sc. (Idaho),

Fruit Section, Lyallpur.

In India litchi was first introduced in Bengal in the 18th Century and is now found in Bengal, Behar, United Provinces and to some extent in the Punjab in sub-montane districts like Gurdaspur. The most important litchi growing districts in India are, Chittagong (Bengal) Muzaffarpur (Behar) and Lucknow and Saharanpur (U.P.).

The fruit is also grown in Madagascar, Burma and Hawaii Islands. Its original home is said to be in China. Recently its cultivation has spread over many other parts of the world such as U.S.A., Brazil, Jamaica, etc.

The litchi tree is more or less ornamental in nature. It grows 25—40 feet in height and has a well-shaped, broad and round topped crown giving it a majestic appearance. The foliage is abundant and glossy green. The trees blossom in the month of February. The fruit is produced in loose clusters of 2-3 to 20 or more and ripens in the months of May, June.

The litchi can be grown successfully in tropical and sub-tropical regions where the soil is deep and moist and frosts very rare. Dry climate, severe winters and frosts are injurious to the plants in the early stages of growth. Young plants should, therefore, be protected carefully, in winter, for the

first few years. Mature trees can, however, withstand the onslaught of frost successfully. Soft rich soils of alluvial origin coupled with abundant rainfall during summer are very desirable for its cultivation. In short, for successful growing of litchi the following important points should be borne in mind.

1. Absence of heavy frosts.
2. Deep rich alluvial loam soil.
3. Moderately hot and moist climate.
4. Abundance of soil moisture.

Young litchi plants are planted in the field 30—40 feet apart. Pits are dug in the soil to a depth of $2\frac{1}{2}$ to 3 feet and filled with soil which has previously been mixed with well-rotten farm yard manure or leaf mould and silt. The pits are then watered to bring about proper settling of the soil in them.

Transplanting is usually done after 4 to 5 days of watering, when the soil is in proper 'wattar'.

During the early stages, after transplanting, the plants require frequent watering, about twice a week when rains are scarce. When the trees are well established, the number of irrigations may be reduced.

Like other fruit trees litchi also requires regular manuring at the proper time. Well rotten farm yard manure (5—10 srs. per plant) can be used with success for young plants. Application of heavy doses of manure during the early age of the plants should be avoided.

In the Punjab, pruning of litchi plant has received very little attention. The only pruning given is when the fruit is picked along with branches 10—12 ins. long and this is thought by some growers to be very necessary for the continued productivity of the trees.

In order to ensure early bearing, productiveness and uniformity of fruit, litchi is propagated by branch layering or 'Gootee'.

The most suitable time for layering litchi is during spring and monsoon in the Punjab. It takes about 3-4 months for the layered shoots to establish an independent root system, after which they can safely be severed from the mother plant and planted out.

Litchi can also be propagated from seed. The seeds are short-lived and when removed from the fruit, remain viable only for a few days. But since plants propagated by seed seldom come true to type and they take, comparatively a longer time to come into bearing, preference is given to propagation by layering.

Litchi is a fairly long lived tree. It usually comes into bearing at the age of 4-5 years, although bearing in some cases may be as late as 6—8 years. Layered trees usually come into bearing much earlier (3-4 years after planting out).

A few varieties of litchi have been tried in the Punjab. Those that have proved successful, are:—

Litchi red, litchi bedana early ripening, litchi bedana late ripening, litchi Calcutta, litchi Ram Bagh and rose-scented.

RENEWAL OF MEMBERSHIP

"Ordinary" and "Regular" defaulting members of the Punjab Provincial Co-operative Fruit Development Board are requested that as their term for membership for 1939 has expired on 31st Dec., 1939 they should remit their renewal fees by Money Order. "Regular" members are required to remit Rupees six each while "Ordinary" members an amount of Rupees three only. "Life" members who have not completed the instalments of their life membership are also requested to do so now.

Canning of Tomatoes

By

Mr. G. L. Tandon, M.Sc.,

Fruit Section, Lyallpur

Tomatoes are now considered as one of the best natural sources of Vitamins. These in the Punjab can be had in abundance from the beginning of May to the end of June. The price during these months ranges from annas 10 to Rs. 1|4/- per maund for the best quality tomatoes being cheapest in the month of May.

Picking of tomatoes.—Tomatoes should be picked when they begin to turn red, preferably in the early morning and should be canned as soon as possible after being picked. If, however, they are to be kept for some time, they should be stored in a cool dry place.

Varieties of tomatoes suitable for Canning.—For canning purposes the variety used should be smooth and of deep red colour. Corrugated tomatoes are difficult to peel. Experiments conducted in the Fruit Preservation Laboratories have shown that the Peshawar variety is very good for juice making but the varieties recommended by various authors for Canning are San Jose and Stones.

Selection of tomatoes for Canning.—The first step in canning is the selection of tomatoes. In order to get a high quality product, select only sound firm ripe tomatoes of medium size and uniform shape and colour. It is advisable

to discard a whole tomato rather than risk the contamination of an entire lot of good tomatoes by using tomatoes from which rotten portions have been trimmed. Do not use green or light coloured tomatoes as they lower the grade of the pack. Fruits of undesirable shape, size or colour should be rejected and may be used for soup or ketchup manufacture.

Washing.—Wash well in running water to remove dust etc.

Scalding.—The object of scalding is to make peeling easy. After washing, the fruit should be heated long enough to crack and loosen the skin. There are two methods of doing this:—

(1) by steam (2) by boiling water.

(1) **Scalding by steam.**—Place the tomatoes in a sieve or in any perforated pan and place it on a "Patila" (boiling pan) containing boiling water so that the tomatoes do not touch the water. Scald for 10 to 12 seconds and then place the tomatoes in cold water to loosen the skin and prevent softening of the fruit.

(2) **Scalding by boiling water.**—Put the tomatoes in a wire basket in shallow layers or in a muslin cloth and immerse them in boiling water in a pan, for one to two minutes according

to the ripeness of the fruit or till the skin cracks. Remove and plunge quickly into cold water to prevent cooking and softening. Sudden change in temperature breaks the skin and makes peeling easy. It also fixes colour.

Peeling.—Peels should be removed from the blossom end to the stem without removing any pulp, while the core should be removed as the last operation with a sharp slender pointed knife, without injuring the shape of the fruit. If the pulp adheres to the skin, the tomatoes have been scalded either too long or not long enough; peel promptly. Do not peel any more than may be immediately canned, as tomatoes ferment quickly.

The peeled tomatoes should be placed in shallow pans to keep them whole. If placed in heaps the super-imposed weight on the lower portion would crush them. A number of machines are available in the market for peeling but none of them is so efficient in keeping the tomatoes whole, as hand labour.

Filling in Cans or Jars.—Filling is done by hand if best quality product is to be produced. Pack the prepared fruit directly into Cans or hot Jars. If the tomatoes are too large to slip into the jars easily, cut them through the centre from stem to blossom end with a sharp knife. Cut out a small portion like the section of an orange, press the cut sides together and slip the tomatoes into the jars or cans as tightly as possible. To prevent undue shrinkage and to help to drive out the air without crushing, select small tomatoes so that they may go easily into the jars or cans. Fill to within 1/4 inch. from the

top, press down gently with table spoon and shake down fruit to fill crevices.

Seasoning.—In order to improve the flavour of the product add one or two tea-spoonful of sugar and a level tea-spoonful of salt per quart or can No. 3. In order to have thorough mixing, the mixture of sugar and salt should be added when the can is half-full. For special packing, sweet pepper, chillies, okra (Bhindi tori) and corn may be packed along with the tomatoes.

Addition of tomato juice.—A common fraud in canned tomatoes is the use of water in the product. Water should not be added in the can, as sufficient liquid will come from the tomatoes but, if so desired, the juice pressed from the smashed tomatoes or the juice which drains during peeling or trimming may be added. In a properly filled can there will be hardly any space for the addition of juice. The juice should be added after heating it. Tomatoes canned with juice are known as "Standard Pack" and when canned without juice as "Solid Pack". Juice is only added to fill interstices in the packed tomatoes and to preserve the shape.

Exhaustion.—Since tomatoes are filled cool into cans, it is necessary to secure vacuum by exhausting. This is necessary because it forces out air, and hence oxygen which destroys Vitamin C, it also combines with the tin of the can and forms a substance which may be harmful. Exhausting by slow heat is preferable to a quick process at high temperatures. In order to achieve the above result, fill the trays with cans or jars on which lids are loosely placed, and place them in an open vessel (like a 'Patila') containing

water near the boiling points for three to five minutes. For commercial work the exhaust box may be used.

Exhaust cans No. 2 and 3 and glass jars for 3 to 5 minutes and seal them air tight.

Sterilization.—The principles of sterilization are always the same whether applied to tomatoes in glass or in Tin Cans. It is always necessary, in either case, to sterilize the product completely and to exclude outside air. Tomatoes are easy to Can because they have a large amount of acid which checks the growth of heat resisting bacteria. They are therefore, completely sterilized at 212° F.

The following table gives the time and temperatures required for various sizes of cans:—

	Time for Sterilization.	Temperature.
Can No. A2	30 minutes	212°F
Can No. A2½	40 minutes	212°F
Can No. 3	45 minutes	212°F

When canning tomatoes in glass jars, fill quite full and process for 30 minutes.

Cooling.—After sterilization, cans should be cooled immediately in running water and jars should be placed in a cool dry place.

Balance your food with fruit

MANGO—preserved or dried

Delicious varieties of Mango are grown in Malda of Bengal. Its sweet taste and pleasant flavour are well known from time immemorial. It is rich in vitamin C & A.

The fruit is available for a short time in June. To make it available throughout the year it has been preserved in can and also dried and kept in cardboard box. Everything is done scientifically so as to keep its vitamin value to a great extent.

One can of preserved mango about 1 lb. 4 oz. in weight is priced at 9 annas each and one packet of dried Mango about ½ lb. in weight is valued at 6 annas each. Packing and freight extra.

All remittances and communications should be made to

MANINDRA BHUSAN SINHA,
P. O. CHAPAI-NAWABGANJ. (MALDA.)
BRANCH—P. C. KATRASGARH, (MANBHUM)

While replying please mention the Punjab Fruit Journal.

Better Spraying, Better Fruit

By

Mr. Dina Nath, B.Sc., L. Ag.,

Entomological Section, Lyallpur.

Citrus fruit occupies an important position among the fruits of the Punjab particularly in the canal colonies, but unfortunately it suffers considerably from the ravages of a number of insect pests of which Citrus Psylla is one of its most serious enemies.

A number of articles have been published from time to time in the 'Seasonal Notes' on the activity of this pest and its control, and a departmental leaflet (No. 9) on the subject is also available for the information of citrus growers. The efficacy of Rosin compound which is generally recommended for its control has been extensively tried and successfully demonstrated in numerous gardens in the various localities of the province in the past but several complaints about the damage of this pest are still received every year. During the last spring the attack of this pest was unusually severe. It is, therefore, essential for the garden owners to understand the cycle of activity of the insect and when and how best to spray against it. It cannot be disputed that timely and proper spraying will yield better and more fruit.

Citrus Psylla is found on the trees throughout the year and breeds on young leafy buds whenever they appear. Citrus is an evergreen tree and although there are two main flushing seasons viz., Feb-

ruary-March and July-August, the trees are putting forth new leaves practically all the year round and thus the insect continues breeding on them. Further, the insect passes its life mostly in the adult stage and can migrate to other trees especially during the flushing season and cause infection. During winter it is found on the underside of the leaves of any citrus plant or even other kinds of fruit trees growing close to the citrus trees. Citrus hedge forms the most suitable shelter for the insect during winter. It may be further pointed out that the insect can be best controlled in the nymphal stage when it is on the terminal shoots and is not able to escape by flying.

The failure in the control of the pest is usually due to the inefficient manner in which spraying is carried out. Although spraying is generally considered to be an easy and simple task, it requires a good deal of care and experience. If it is not carried out by proper method and is done with undue haste its efficacy is lowered and the operation may lose its value. The efficacy of spraying depends upon the quality of ingredients, proper preparation of the insecticide, correct dilution and the thoroughness with which it is applied.

The best method of testing the thoroughness of a spraying operation con-

sists in occasionally examining the trees at the time of spraying while the trees are still wet and to find out the portions of the treated trees left unsprayed. The results should also be checked from the mortality of the insect. If the surviving insects are found in large numbers the efficiency of the operation should be improved by removing any of the above mentioned defects. It must be remembered that every insect missed is a potential parent of a large and hungry family that will secure support at the expense of the trees and will lower the yield and endanger their life. Further, the mistake of saving a few gallons of spray at the risk of leaving insects unkilld should be avoided. Go over the work frequently and check up to see that the standard of efficiency is being maintained.

Sometime just one spraying is not sufficient and the treatment has to be repeated till the insect is appreciably reduced. The trees should be examined at different times of the year and spraying undertaken whenever the insect is noticed increasing in number.

The best time for spraying citrus trees is winter when the insect is inactive. Its number should be reduced before the breeding season starts. In certain cases spraying may be carried out in the beginning of February to kill the nymphs if they are found in large numbers. Spraying should, however, be finished before the flowers open.

For further particulars in this connection enquiries may be made from the local Agricultural Assistant or directly from the Entomologist to Government, Punjab, Lyallpur.

WINNER of SEVERAL FIRST PROVINCIAL PRIZES

Genuine Blood Red Malta Plants are available for sale from the garden of **BAKHSI KANHIYA LAL**, Advocate and Municipal Commissioner, Gujranwala.

Nursery is approved by the Government.

پنجاب فروٹ نمائش میں کئی ایک اول انعام پانے والے سوخ مالٹہ کے پودے
بخشی کھنڈا لال اینڈ وکلیٹ میونسپل کمشنر گوجرانوالہ کے باغ سے خریدے گئے ہیں۔
مالٹہ پھل کا سلاطہ، ڈسمبر و جنوری میں فروما سکتے ہیں۔

While replying please mention the Punjab Fruit Journal.

Horticultural Knowledge from Far and Near

Compiled by

S. Harindar Singh Dinsa, M.Sc. (Kansas),
Assistant Professor of Horticulture,
and

M. Musahib-ud-Din, B.Sc. (Agri.),
Fruit Section, Lyallpur.

PRESERVED FRUITS OVER A CENTURY OLD FOUND STILL GOOD

Publication No. 85 of the International Tin Research and Development Council as reported in "Chemistry and Industry" 1938 gives report of analysis along with photographs of the cans. These tins had been in the Royal United Service Museum and the National Museum, London. Two of the tins are those taken along by Sir Edward Parry, the arctic explorer, on his expedition of 1824, one of the two tins contains carrots and the other meat. On opening their examination and analysis revealed that they were in fairly perfect condition.

Honey as a stimulant to the rooting of cuttings.—Oliver, R. W. has found that honey has a definitely stimulating effect on the rooting of cuttings of *Thuja occidentalis*, *pyramidalis* and of *chrysanthemum*. The best treatment consisted in standing the cuttings in a 25% sol. of honey for 24 hours before planting. A higher percentage of cuttings rooted and there were more roots per cutting; the response, more-

over was only very slightly less pronounced than that which followed most favourable hormone treatments. The substance or substances stimulating root formation have not yet been isolated from the honey.

—Horticultural Abstracts: Sept. 1939.

STUDIES IN NURSERY TECHNIQUE SHIELD BUDDING TREATMENT OF INSERTED BUDS WITH PETROLEUM JELLY

Staniland and Umpleby had already shown that the treatment of newly inserted buds with petroleum jelly prevented damage by the red bud borer (*Thomasiniana oculiperda* Rubs.). The present authors working with buds of Cox's Orange Pippin apple on E. M. 11 rootstock in May, 1938, and on E. M. IX rootstock in August, 1938 some 1,600 buds being inserted, showed that a definite increase in bud take followed treatment even when no question of insect damage arises. They recommended a trial of this simple and cheap precaution.

—Horticultural Abstracts: Sept. 1939.

ROOT-STOCK TRIALS ON LEMONS

Batchelor, L.D., and Webber, H.J. report on the rootstock trials on the basis of the experiments conducted in California at the Riverside Experiment Station and elsewhere as follows:—

The sweet orange stock has proved for the lemon to be superior to all others tried in promoting uniformity, size and yield. Sour orange and rough lemon are more adapted to light than to heavy soils. On sour orange roots on heavy soil the lemons used (Eureka and Lisbon) have been upto 50% affected with decline after the 12th year. On sandy soil decline is practically non-existent on sour stock, but on rough lemon it is more apparent. Mandarin orange and Sampson tangelo as stocks for lemon have shown resistance to gummosis and freedom from lemon decline. Possibly they are more suited to the heavier soils. Grapefruit stocks have been more variable and have resulted in lower yields than other stocks.

—Horticultural Abstracts: Sept. 1939.

REDUCTION OF CRACKING IN SWEET CHERRIES FOLLOWING THE USE OF CALCIUM SPRAYS

Cracking in cherries at Idaho University was greatly reduced by spraying the fruit on trees with solutions containing calcium, including Bordeaux mixture. The residue left on the fruit by the calcium spray is, however, an objectionable feature in the practical application of the method. Calcium hydroxide left the least residue. The fruit can be sprayed when quite small.

—Proc. Amer. Soc. Hort. Sci. for 1938.

THE EFFECT OF ORDINARY AND COLD STORAGE ON VITAMIN CONTENT IN FRUIT AND VEGETABLES

Practically no loss of Vitamin A occurs during a short storage of fruit and vegetables at room temperatures. At lower temperatures, the loss is even smaller and in frozen vegetable foodstuffs Vitamin A content is almost as high as in fresh vegetables and fruits. Vitamin D and E remain fairly constant in storage and cold storage. Vitamin B complex does not fall after several months of storage or freezing of the vegetable product, in fact rice can be stored for several years without much of this vitamin being lost. Vitamin C is extremely sensitive to storage. It remains fairly constant in acid vegetables and fruits even at room temperature, but is destroyed very rapidly in vegetable products, the cell juice of which has a high Ph. value, and which are exposed to the action of oxygen. Such vegetables and fruits as can be preserved by freezing at low temperatures, such as—18°C, not only retain their flavour, colour and aroma, but also their vitamin C content, provided they are used at once or soon after thawing.

—Horticultural Abstracts: Dec. 1939.

FOOD VALUE OF FRUIT RIND

(1) The ratio of the skin to the pulp is higher in small apples than in large ones and the skin contains a higher concentration of Vitamin C. than the pulp according to Batchelor and Overholser. We should therefore give preference to smaller apples for table purposes and eat them unpeeled.

(2) Hou found highest concentration of vitamin C in the green or yellow skin of citrus fruits less in the white inner skin and least in the juice. Utilization of the peel and the white portion of the skin in addition to the juice is therefore recommended. Candying of peels of citrus fruits in larger quantities is suggested.

(3) Tressler and Mack report an increase in ascorbic acid content as tomatoes ripened, whereas a decrease was noted in peas. So eating of fully ripe tomatoes and slightly under-ripe peas is recommended.

—Proc. Amer. Soc. Hort. Sc. '38.

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While replying please mention the Punjab Fruit Journal.

Annals of the Board

By

K. L. Kohli, M.A., L.S.G.D.,

Assistant Secretary,

Pb. P. C. Fruit Development Board.

During this quarter the Publication and the Nursery Standing Committee of the Board met on 13th April, 1940 to consider the budgets of the respective schemes for the year ending 31st March 1941. Other vital matters connected thereto were also discussed.

1. Associate members to be enlisted from all over India, Burma & Ceylon.

In view of the pressing demand from the public, outside the Punjab, to avail of membership facilities, it was decided that a register of Associate Members may be opened and persons enlisted therein be given all privileges of membership except participation in voting and management, on terms and conditions similar to those applicable to members. The annual subscription for Associate Members, was fixed at Rs. 6/- per annum and Rs. 50/- for Life Associate Members.

TO THE SUBSCRIBERS

The publication Standing Committee, in view of the increased cost of production particularly cost of paper and other printing accessories, approved the proposal that the subscription of the journal may be raised from Rs. 2/- to Rs. 3/- per annum with effect from 10th May, 1940. As regards departmental subscribers, in bulk, the Committee decided to allow the old subscription rates i.e. Rs. 1/8/- per annum.

2. Re. Consideration of budget estimates of the Nursery Scheme for the year ending 31st March, 1941.

The members of the Committee, opined that with a view to popularize the scheme, the price of plants available in the nurseries of the Board, should be kept reasonably low, so as to favourably compete with the rates charged by other nurserymen and Government departmental nurseries. It was accordingly calculated that the anticipated income from the scheme for the year ending 31st March, 1941 would be Rs. 4,500/- against the anticipated expenditure of Rs. 7,000/-.

3. Nursery Scheme Makes a Headway.

Since reporting in the last issue, the nurseries of the Board, at Mian Channun, District Multan and Jamalpur, District Gurdaspur, have made very satisfactory progress. It is estimated that in February-March, 1941 we will have about 9,000 pedigree plants available for sale. Out of this supply we intend to meet the demand of all small indents in full, consequently members and associates of the Board are requested to distribute their indents evenly so as to include all or most of the citrus plants as mentioned in the plant order coupon given on the next page.

4. Proposal for acceptance of the Agency offered to the Punjab Fruit Development Board by the Guntur Co-operative Society Reg. marketing of limes

in the Punjab Vis-a-vis starting of the Fruit Marketing Programme.

In early January, 1940, following the annual general meeting, the President Guntur District Fruit Growers' Association Tenali, Madras Presidency, approached us offering an agency to the Board for marketing Guntur Limes and oranges in the Punjab. The proposal in question was circulated to members of the Fruit Marketing Standing Committee for their opinion.

The consensus of opinion received from the members indicated that although ordinarily the Board should have taken up the paying agency in question, the same may be, however, postponed till the financial position of the Board is on better footings and the marketing scheme of the Board is matured and taken in hand.

5. Demand for Providing Motorable Road to Mukerian Railway Station.

Under the leadership of S. Ram Singh Ex. M.L.C. of Ghandaran, Nurpur Tehsil, about eighty fruit growers of Nurpur Tehsil, District Kangra and Dasuya Tehsil, District Hoshiarpur have forwarded to the President of the Board a weighty memorandum mentioning their difficulties in conveying their fruit and vegetable produce to Mukerian, the nearest railway station, due to the absence of a motorable road.

Accordingly the President of the Board is taking suitable measures to move the Hon'ble Minister for P.W.D. to kindly look into this matter.

6. Annual Inspection

The Annual Inspection of the Board was conducted by Ch. Mohd. Sharif Inspector Co-operative Societies Lahore Tehsil from 11th to 13th June, 1940 (both days inclusive). The inspection note, which is pending consideration of the Accounts Sub-Committee, contains a number of thoughtful and constructive

suggestions. One of the important suggestions made by the Inspector is that, in his opinion it should not be obligatory for a member to nominate a nominee.

PLANTS ORDER FORM

To

The Honorary Secretary,
Punjab, P.C. Fruit Development Board,
Lyallpur.

Dear Sir,

I am a MEMBER|ASSOCIATE|SUBSCRIBER (No.——) of your Board. Kindly supply me from your Mian Channun|Jamalpur Nursery, plants, as per details given below:—

Variety	Number
1. Malta Common
2. Malta Blood Red
3. Malta Musambi
4. Sangtra Common
5. Sangtra Ladu
6. Sangtra Nagpur
7. Narangi
8. Grape Fruit
Total

The plants, as ordered, may be despatched to me at _____ Railway Station. I will send the cost thereof by Money Order as soon as I receive a reply from you that the plants are available.

Yours Faithfully,

Name _____

Address _____

Dated: _____

[Please write legibly in block letters.]

Chronicle of the Fruit World (Indian Section)

By

K. L. Kohli, M.A., L.S.G.D.,

Assistant Secretary,

Punjab P. C. Fruit Development Board.

1. HORTICULTURE MADE A MAJOR SUBJECT FOR B.Sc. EXAMINATION IN AGRICULTURE OF THE PUNJAB UNIVERSITY

Horticulture has been made a major subject in the Punjab Agricultural College alternating with crop Botany. Students can now take up this subject for the B.Sc. (Agri.) degree in their fourth year.

This subject is already proving popular and there is a keen demand for specialisation in this line.

Horticulture can also be taken up for the M.Sc. degree and it is for the first time that three students are studying this subject for earning M.Sc. degree and many more are seeking admission.

2. SHORT COURSE IN FRUIT PRESERVATION FOR LADIES

A two weeks' course in Fruit and Vegetable Preservation for ladies only will be held at the Punjab Agricultural College, Lyallpur, from 29th July to 12th August, 1940. Not more than twenty five candidates will be admitted. Minimum educational qualifications for admission will be a standard equivalent to the Matriculation of the University of the Punjab. Tuition fee is Rs. 5/- for Punjab candidates and Rs. 15/- for candidates coming from Indian States or other Provinces. Accommodation will be provided in the hostel on payment of a rent of Rs. 21/40 plus light charges. A security of Rs. 5/- refundable on the completion of the course, is charged. Candidates have to make their own mess arrangements.

3. PUNJAB SUMMER FRUIT SHOWS

(i) A Semi-Provincial Mango Show at Jullundur.—A semi-provincial mango show

for Jullundur, Lahore and Ambala Divisions and the Shiekhupura district was held at Jullundur from 10th to 11th July, 1940.

(ii) A Mango Show at Karnal.—A district Mango Show was held at Karnal from 13th to 15th July, 1940 under the auspices of the District Fruit Growers Association Karnal.

(iii) A Mango Show at Lyallpur.—A District Mango Show was held at Lyallpur from 19th to 20th July, 1940.

(iv) Divisional Mango and Date Fruit Show at Multan.—The Punjab Agricultural Department will hold a Divisional Fruit Show (Mangoes and Dates only) for Multan Division only in the District Board Hall at Multan on 29th and 30th July, 1940.

4. PROVINCIAL MANGO SHOW AND THE ANNUAL GENERAL MEETING OF THE U.P. FRUIT DEVELOPMENT BOARD, AT LUCKNOW

The U.P. Fruit Development Board in co-operation with the Agricultural and other development Departments organised a "Provincial Mango Show" at Lucknow from 20th to 22nd July, 1940.

The Annual General Meeting of the U.P. Fruit Development Board was also held on the 21st July, 1940, along with the Mango Show, in the hall of the U.P. Fruit Development Board, Sikandar Bagh, Lucknow.

5. SUMMER FRUIT SHOW HELD IN PESHAWAR

The Agricultural Department held a summer fruit show in Peshawar from July 19 to 21.

6. BRITISH MARKET FOR INDIAN CANNED FRUIT PRODUCTS

The Indian canned mango has completely pushed out its Japanese rival in the European markets, by sheer superiority of flavour. This is despite the fact that the Japanese canned mango was offered at a much lower price.

More and more Indian brands are being expected, according to the Indian Trade Commissioner in London, but only two or three of these have a good hold on the market on account of their superiority, over the new-comers, in quality and grading. The Japanese mango has ceased to compete in the markets.

"GUAVAS" COMPOSITION

In "guavas" however, there is keen competition between India and South Africa. One or two brands of tinned South African "guavas" have been on the British market lately and the prices are cheaper than the Indian variety. South African "guavas" are sold at 12s. a dozen, while those from India cost as much as 16s. 6d. a dozen, wholesale.

The South African "guavas" are more red in colour and are canned in well-graded halves with the seeds left in. They are preserved in clear syrup while the Indian "guavas" are indifferently graded and the syrup is thick and occasionally cloudy.

Exhibits of bottled Indian pineapple slices received by the Trade Commissioner have no chance against the Malayan and Californian tinned pineapples which, besides being cheaper, are much better graded.

—The National Herald Dated 18-11-39.

7. HORMONES FOR PLANTS

Experiments with Indian Mango and Litchi Cuttings.—Experiments are being made with growth-stimulating plant hormones in several parts of India.

It has for long been known that in the bodies of human beings and animals certain substances are produced which affect the development and behaviour of their bodies. These substances are known as hormones. It has now been discovered that hormones are also present in plants.

Scientists have evolved a synthetic plant hormone known as "Hortomone A" which has been tested at the Kodur Research Station on cuttings of Mangoes and other crops, and on grape cuttings in Bombay.

In Bihar, chemical growth-promoting substances have been tried on mango and litchi cuttings. The litchi responded well, but the mango has not yet shown much promise.

—The Indian Information April 15, 1940.
P. 232.

8. FORMATION OF A FRUIT MARKETING BOARD IN THE N.W.F.P.

The Secretary, Fruit Marketing Board N.W.F.P. informs us that the Fruit Marketing Board has recently been constituted by the Provincial Government as an Advisory body on which both the officials and the fruit growers and traders interests are represented. The Board is working under the immediate guidance of Khan Mohammed Aslam Khan, Agricultural Officer, N.W.F. Province.

9. KUMAUN FRUIT GROWERS SOCIETY IN FORMATION

It is expected that the Kumaun Fruit Growers Society will start functioning from next month. The Director of Agriculture, U.P. has very kindly placed the services of an experienced Horticultural Assistant at the disposal of the Society. This Assistant will act as Secretary of the Society. The Government has also been approached for allotment of funds for a grading Scheme, which will be run by the Provincial Marketing Officer U.P. for the benefit of the members of the Society.

—The Journal of the U.P. Fruit Development Board May 1949.

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While replying please mention the Punjab Fruit Journal.

Chronicle of the Fruit World (Foreign Section)

By

K. L. Kohli, M.A., L.S.G.D.,

Assistant Secretary,

Pb. P. C. Fruit Development Board.

Due to the outbreak of war, there has been considerable dislocation in the fruit trade. Countries, whose markets were in Europe, are anxious. The purchasing power of most European countries has already decreased and many of the European Neutrals have little chance of material gain from the war. A brief resume as to how the war dislocated the fruit trade of the various countries is given below, for the information of the readers under items No. 1-3.

1. A New problem for the Palestine Citrus Industry.—Palestine's exportable citrus crop, for the 1939-40 season, is estimated at 15,000,000 cases, which is about as large as the previous seasons. Lack of transport facilities, makes it unlikely that more than one-half of the crop will be exported. Utilization of a larger part of the crop for by-products manufacture is being considered. By-products include alcohol, acetone, calcium citrate, essential oils, canned fruit, juice, fodder, and fertilizer. However, these industries have used only a small share of the crop in the past and there is little likelihood that they can be expanded to use the large part of the crop normally exported.

California Citrograph February, 1940.
P. 117.

2. Government Assistance to Citrus Growers of Palestine.—After a long period of anxiety the citrus growers community have been informed, through a broadcast on 15-4-40, by H. E. the High Commissioner for Palestine, that the British Government have come to an agreement with a number of banking institutions, who work in Palestine, the result of which will be that the growers will get the cultivation loan, in about the same way, as they have been getting before war.

The Government has further announced a reduction in the rate of rural property tax on citrus land (excepting that in Acre sub-district) from 400 miles to 150 miles per 'dunam' for the year 1939/40.

Hadar Tel. Aviv. P. 199 April, 1940.

3. Egyptian Citrus Industry in Difficulty.—With the German market closed this year to imports from Egypt growers and exporters of citrus, in that country, are seeking other markets for their crop. About 85% of Egypt's orange and tangerine crop went to Germany in 1939. They are attempting to develop British markets, but it is thought that Spain and Palestine will account for most of Britain's citrus imports. The Sudanese market offers possibilities, provided transportation charges can be reduced.

California Citrograph Feb. 1940. P. 110.

4. Trend of Citrus Industry in Spain.—Spanish exporters expect a serious cut in sales owing to shipping difficulties. Prior to the outbreak of war, export for the 1939/40 season were estimated at 9 to 10 million boxes, about half of which were intended for the United Kingdom. Recent estimates calculate export at five million boxes. The Spanish orange crop will be, at the cost, 60% of the normal, owing to the damage done to the groves during the civil war.

Hadar Tel. Aviv. April, 1940.

5. Freeze takes Heavy toll of Citrus in Florida and Texas.—Freezing temperatures, which struck Texas about the middle of January and Florida about the end of the same month, wrought havoc with the citrus yield expectation. It appears that the damage was most severe and, at first, there was even suspicion of loss of the entire crop. Later and less pessimistic esti-

mates were not so drastic and the most recent surveys indicate that approximately 60% of the shippable Valencia's and 45% of the grape-fruit would be lost while Washington Navels were even more seriously affected. Temperatures fell as low as -12° C. (10° F.).

This catastrophe has, at least, brought one consoling feature in its wake, the anxiety as to provision of ways and means for the disposal of the surplus crop, which has been growing more acute, has been postponed for a year. Californians, fortunate enough not to have suffered the ravaging cold, are looking forward to higher net prices due to the comparatively non-competitive home markets awaiting them.

Although the citrus industry of the U.S.A. is not dependent on European markets, since most of the crop is consumed at home or in Canada, small quantities are exported to relieve these markets from the danger of over supply and the consequent reduction in price levels. It is for this reason that U.S.A. citrus fruit is exported to Europe, despite the fact that the returns are not attractive.

Hadar Tel. Aviv, April 1940. P. 120.

6. **Race of Fruits in U.S.A.**—Prices of fruits, in general, have been at relatively low levels for several years, and it is apparent that as supplies continue, it will be increasingly difficult to dispose of fruit supplies at reasonable returns to the growers, unless there is a marked improvement in the level of consumer purchasing power.

On a per capita basis, the annual average per capita production, of the 13 major fruits, increased from 176 pounds for the five-year period, 1919-23, to 207 pounds during 1934-38. The per capita production of apples declined 20 per cent during this period whereas that of all citrus fruit doubled.

Cherries, pears, plums and prunes, olives and apricots increased materially in per capita production over the same period; grapes increased moderately, peaches declined slightly after a temporary increase; strawberries increased rapidly during the middle of the period but are now only slightly higher than in 1919-23.

From present indications, it appears that, during the next five seasons, a larger per capita supply of fruit may be expected but an increasing proportion of this supply will be comprised of citrus fruits.

The per capita consumption of fresh and canned fruit also has increased materially during the last 20 years but that of dried fruits has decreased slightly within the last decade.

Better Fruit, December, 1939. Page 6.

7. **Canning Industry makes headway in Texas State.**—Approximately 43 per cent of last season's Texas State citrus crop was put into cans.

P. 100 Citrograph Feb. 1940.

8. **Importance of Prune Industry in California.**—Importance of the prune industry to California is indicated in the fact that prunes are grown in 48 of the State's 58 countries. The prune acreage of California is as follows:

bearing	153,795,
non-bearing,	8,881,
Total	162,676

Of all the prunes grown in California, the variety known as French is the most popularly planted showing a total acreage of 134,087. Other prune acreages are as follows: Sugar, 7,822; Imperial, 13,984; Robe de Sergeant 2,736; Burton, 2,386; others, 1,746.

Better Fruit, Jan. 1940. Page 14.

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COMMERCIAL GLIMPSES

By

Mr. K. L. Kohli, M.A., L.S.G.D.,

Assistant Secretary,

Punjab P. C. Fruit Development Board

WAR TIME SUPPLIES OF SULPHATE OF AMONIA

Since the beginning of the war it has been difficult for the Zamindars to secure supplies of Sulphate of Ammonia. We are now pleased to inform our readers that due to their worldwide connections, M/s Imperial Chemical Industries (India) Ltd. have been able to arrange for the supplies and their distributors in all important markets now hold adequate stocks. Fruit growers will, however, appreciate that due to outbreak of war, the cost of production, freight and insurance have increased considerably, and the Company have had to increase their prices slightly. M/s Imperial Chemical Industries (India) Ltd. Karachi will be only too pleased to give zamindars free technical advice on the use of their fertilisers.

Pioneers in Fruit Canning.—The romance of rise of M/s Harnarain Gopinath from a modest obscure shop, dealing in indigenous pickles and chutnies to one of the foremost modern canners of India-wide repute, presents an interesting reading. Eighty years ago, in the year 1860, this firm made a very humble start in Delhi with scanty capital and slender resources amidst conservative unsentimental atmosphere. But by a careful adherence to a defined progressive policy M/s Harnarain Gopinath have been able to build ever-increasing business connections all over the country and abroad to supply wholesome canned fruits and vegetables, which compare very favourably with the very best foreign brands; and in fact some of their varieties are unique in themselves.

All-India Fruit Party at Ramgarh Congress.—M/s L.R. Brothers, Saharanpur on the occasion of the last annual session of the All-India National Congress held at Ramgarh arranged a very successful fruit party to introduce fruit industry amongst all-India Congress leaders and members of the Reception Committee. Over 600 covers were laid. Topical film was also taken

of this all-India Fruit Party, and all present were highly impressed with possibilities of fruit farming in India.

Free Training in Practical Horticulture.—M/s T. R. Churthal another progressive nurserymen and seedsmen of Saharanpur who are already well introduced to the Agricultural circles in the U.P. for supplying reliable quality fruit plants and seeds, have from this year undertaken to furnish their customers with suitable garden plans for designing of gardens etc. gratis, without

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1. Gratis supply of copies of the Punjab Fruit Journal
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Regular Member : Rs. 6/- annually.

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Apply to:—

HONORARY SECRETARY,

Punjab P. C. Fruit Development Board,

Punjab Agricultural College, LYALLPUR.

obligations. Further to arouse the popular interest in gardening arrangements have now been made to impart free training in horticulture at their Horticultural Farms which is reported to be an ideal Horticultural workshop. The nursery is duly registered and approved by the U.P. Fruit Development Board.

A Headmaster takes up fruit marketing business.—Mr. A. F. Syed-ul-Haq who was formerly in education line as Headmaster has organised a modern marketing commission agents firm under name and style of Shamim and Co. at Hogg Market Calcutta—one of the biggest fruit markets of the East. We are pleased to learn that various provincial marketing officers including Marketing Officer, Assam, Punjab have already extended their patronage and have sold graded fruits through this educated firm. Marketing Officers of U.P., Bihar and Deputy Director of Agriculture, Nagpur, C.P. have also agreed to market their fruit through this agency in Hogg Market Calcutta.

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REVIEWS

THE PUNJAB AGRICULTURAL COLLEGE MAGAZINE: Insect Pest Number (May-July 1940). Edited by Dr. Khan A. Rahman, B.Sc. (Edin.), Ph.D. (Cantab.), F.R.E.S., Entomologist, Punjab Agricultural College, Lyallpur. Pp. 98. Price Re. 1/-.

This attempt deserves the appreciation of our readers. The Number will be found of great practical utility by all concerned—students, farmers, fruit and vegetable growers, hoarders of grain and research workers. It contains a mine of information on insect pests of farm crops like fruits cotton, sugar-cane, rice, and stored grains. It also deals with general preventive and control measures of the pests of the above mentioned crops. Other important subjects dealt with are preparation of insecticides, and their spraying operations as well as the dusting and spraying machines.

The Number is profusely illustrated with diagrams and photographs of plants and insects to make the subject intelligible to the layman.

We congratulate Dr. Khan A. Rehman on bringing out this useful publication and strongly recommend it to our readers.

S. B. S.

POCHA'S GARDEN GUIDE

Indian arboriculture was badly in need of a text book and "Pocha's Garden Guide" has fulfilled this need to a great extent. It has rightly been called a "compendium of useful information on vegetable, flower, lawn, etc., growing in India." The chapters on manures, insect pests and diseases are also full of very useful information.

The scientific knowledge presented in every one's language is a special feature of this most useful guide which will, undoubtedly, be found handy by both scientific and amateur gardeners.

P. M. D.

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The PUNJAB FRUIT JOURNAL

Vol. IV]

Lyallpur, October, 1940

[No. 16

Registration of Nurseries

The Punjab Unemployment Committee has rightly emphasised that, in the absence of an adequate supply of quality plants of known parentage, people buy cheap plants of doubtful origin. The committee viewed this position with anxiety because, a mistake made in planting a garden, with plants of doubtful origin and of inferior quality, cannot be rectified till such time as the trees come into bearing.

For a sufficiently long time to come, growers will have to knock at the doors of private nurserymen to supplement the supply of plants from Government or Fruit Development Board nurseries. Going a step further, we strongly feel that although, in future, bonafide private nursery-men have a permanent part to play in the economy of fruit growing of this country, we cannot look with equanimity on the recent mushroom growth of unreliable nursery-men, seed houses and gardening firms started in almost all parts of the country, who, with their fanciful catalogues and window-dressings, have been trading upon the ignorance of fruit growers and draining their purse to

the detriment of this growing national industry.

With a view to check this growing menace, the Executive of the Punjab Fruit Development Board have been obliged to take very peremptory steps by introducing a registration scheme for nurseries, seed houses and gardening firms, working all over India. This measure would certainly counter-act the evil a great deal, if not altogether excommunicate the unscrupulous traders in this line. The Board has undoubtedly undertaken a very difficult task in trying to reform the prevalent malpractices in this line of trade. There have been press comments to the effect that any measures on the part of the organisation of the Fruit Development Board would remain ineffective, unless some steps were taken to bring on the statute a regular Seed and Plant Act, on the lines as those existing in many foreign countries. Knowing the limitations fully well, the Executive of the Board felt that this state of affairs could not be allowed to continue any more.

Within the limitations of the law the Board, with its propaganda machinery and an effective all-India organ (The Punjab Fruit Journal) at its disposal, is determined to expose the malpractices of the unreliable seed and plant traders and thus clear the field for bonafide enterprisers. The criterion of reliability, which the Board has fixed, is that the firm concerned, must be able to procure a favourable report from the Agricultural Department of the province to which it belongs.

The organisation of the Board would always be at the disposal of the public to lodge bonafide complaints about the dealings of the approved nurserymen and if on investigation by the Agricultural Department of the province concerned, they are found guilty, the delinquents would, at once, be struck off the register and placed on the black list—a moral indictment by no means less disgraceful.

Preliminary steps have already been taken to compile addresses of nursery firms, seed merchants and gardening firms, from various provinces, through the respective Agricultural Departments. The nurserymen concerned are advised to send in their applications to this office, for registration, at an early date.

Registration rules, framed by the Executive of the Board, are reproduced on the next page for the benefit of our readers.

- (1) BAL SINGH, BAJWA,
- (2) K. L. KOHLI.

OBITUARY

We sorrowfully record the untimely death of K. B. Nawab Ahmed Yar Khan Daultana, a distinguished Life member and Ex-member of the Managing Committee of the Punjab P. C. Fruit Development Board.

Socially, he was a friend of all, always cheerful and an earnest and ardent supporter of the cause of the fruit industry. His irreparable loss is mourned by all.

May his soul rest in peace!

TO SUBSCRIBERS OF THE PUNJAB FRUIT JOURNAL

Most of the subscribers of the Punjab Fruit Journal started subscribing to the Journal from January 1940. With the supply of this issue their annual subscription expires. They are requested to remit rupees three by return to renew their subscriptions during this quarter, failing which the next issue of the journal will be sent per V.P.P. of Rs. 3|8|-.

Rules Regarding Registration of Nurseries, Gardening Firms etc.

1. All applications for registration of Nurseries, Seed houses, Gardening firms etc. should be addressed to the Honorary Secretary, Punjab. P.C. Fruit Development Board, Lyallpur.

2. On receipt of an application the same will be forwarded to the Director of Agriculture of the Province concerned wherein the nursery, Seed House, Gardening firm etc. is situated.

3. On receipt of favourable report from the Agricultural Department concerned the report in question will be circulated to all members of the Managing Committee, after which the Managing Committee of the Board at their next meeting shall decide whether the firm in question is to be accepted for registration. No reasons shall be assigned for such decision.

4. The Managing Committee reserves the right to make any enquiry regarding the business of an applicant.

5. A list of nurseries, Seed houses and Gardening firms etc. registered shall be published periodically in the Punjab Fruit Journal for information of members of the Board and subscribers of the journal.

6. Registration is merely evidence of the date of registration by the Board and cannot secure any rights which the persons registering have not at law.

7. There will be an admission registration fee of Rs. 5/- and annual renewal fee of Rs. 1/-.

8. The applicant will be prepared to pay 6¼% commission to the Board for the orders placed through the Board.

9. Adverse reports from the customers, will entitle the Board to investigate into the allegations, and in case they are found correct, the name of the firm will be struck off from the Register of the Board.

APPLICATION FORM.

For firms desiring to be registered under the Punjab P. C. Fruit Development Board, Ltd.

To

The Honorary Secretary,
Punjab P. C. Fruit Development Board, Ltd.,
Lyallpur.

Dear Sir,

I/We, the undersigned, request the favour of your kindly registering the following Nursery/Seed House/Gardening firm, in the register of your Board:—

Address of } _____
the } _____
firm. } _____

I/We guarantee that:—

(1) Our grafted nursery trees, which we will supply to the public, will be grafted in our own nursery.

(2) The plants produced in our nursery would be propagated from trees of outstanding merit of known parentage.

(3) The plants sold by me/us would be strong, healthy and, free from insect pests and diseases.

(4) The rootstocks used would be those recommended by the Department of Agriculture.

(5) The Nursery/Seed House/Gardening House, under reference has been in my/our possession since _____, and I/we also declare that the same is/are, to the best of my/our knowledge and belief, not owned by any one else.

(6) I/we, hereby declare that I/we have read the rules and conditions regarding registration of nurseries with the Punjab P. C. Fruit Development Board, and agree to abide by them.

The admission registration fee of Rs. 5/- is sent herewith by Money Order.

Yours faithfully,

(Full Signature)

Full name of the Firm _____

Full address _____

Dealers in _____

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Commissioner with the Government of India.

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| 5. Citrus Fruits. | 10. Very useful articles on <i>Mangoes, Dates, Phalsa, Banana and Ber</i> . |

This Number is priced at Rs. 1/8/- including postage on pre-paid Money Order basis or V.P.P. basis; but to regular subscribers of the journal and the members of the Punjab P. C. Fruit Development Board, this number, along with other issues of the journal is supplied free. The Annual Subscription of the journal is Rs. 3/- on pre-paid Money Order basis and Rs. 3/8/- per V.P.P. basis.

For further particulars please write to:—

**The Honorary Secretary, Punjab P. C. Fruit Development
Board, Ltd., Punjab Agricultural College,
Lyalpur, (India).**

Dietetic Value of Grapefruit

By

Lt. P. MAYADAS, B.Sc. (Agri.),

Fruit Section, Lyallpur.

What is grape fruit? It is a species of citrus and is of recent introduction in our province. It seems to have originated from the Shaddock (**Chakotra**) which has long been known to the Indian public for its medicinal and dietetic values. The name grape-fruit has been given to this descendant of shaddock because of its characteristic habit of bearing fruit in clusters, and bunches like the grapevine.

This fruit, as already said above, being of recent introduction in this country,

is not yet well known to the public but in other foreign countries like U.S.A., Canada etc., it has attained a high place in the dietary of the nation. Its dietetic and medicinal qualities make this fruit unique and dietitians have spoken highly of it as will be evident from the account given below.

The Food value of Grapefruit, is evident from the following latest chemical analysis of the most popular variety of this fruit viz. Marsh seedless.

Name of variety.	per cent moisture.	per cent protein	per cent fat.	per cent carbo hydrate.	per cent calcium.	per cent phosphorus.
Marsh seedless	88.5	1.0	0.1	10.0	0.03	0.03
	per cent iron.	Vit. B. Int. units p.m.g.	Vit. C. m.g.p. 100 gms.			
	0.02	40	31			

(Govt. of India Health Bulletin No. 13 of 1932.)

Vitamin value.—It is the high vitamin content, especially of vitamin C (Ascorbic acid), the scurvy preventing vitamin, which makes grapefruit so highly sought after as an essential fruit in the human diet.

The daily supply of vitamin C is a necessity for health and good "tooth nutrition" and all citrus fruits (especially grapefruit) are the richest natural source of this element.

America's leading dieticians, who guide scientific feeding in hospitals, hotels and welfare work, not only serve orange and grapefruit juice to their patients but drink it themselves.

Medicinal value of Grapefruit.—According to Mr. Arthur B. Hale, Director of Prison Camps, U. S. A., "In Florida Prison camps, each prisoner is given a half grapefruit or an 8 oz. glass of grapefruit juice twice daily. As a

result of this all types of illness have been greatly reduced, cutting down medical costs. Colds have been curbed and those who became affected responded quickly to simple treatment."

Experts on mental diseases impress the necessity of keeping mental patients saturated with vitamins B and C. Remarkable improvement has been noted in the condition of the most obstinate type of mental patients when treated as above.

(Calif. Citro, February 1940, p. 97).

Vitamin C prevents scurvy and forms Collagen, the intercellular cement substance, the glue that holds cells together. Thus wounds heal more rapidly when large amounts of citrus fruit juices (e.g. Grapefruit juice) are taken. It is also good for tubercular diseases and respiratory infection.

Citrus juices act as Alkali.—The common belief among ignorant people is that the consumption of acid fruits results in producing acidity in the system. Contrary to this belief, it was shown by Owen Ries in 1849 that citrus juices (the juice of fruits like lemons, oranges and grapefruit) act as alkali. According to him, the acid juice, (containing a considerable amount of oxygen by decomposition) and the blood, favoured the conversion of uric acid into urea and perhaps carbonic acid and thus promoted its elimination. The urine, under its action, becoming neutral or alkaline, and the excess of urates disappearing.

(Later researches have also shown that the citric acid, in the citrus fruit juices, forms alkaline salts of sodium,

potassium, etc., present in the blood thus rendering the blood stream alkaline. Ed.).

(Calif Citro. February 1939. p. 140).

Some palatable ways of serving Grapefruit.—1. Simplest of all fruit servings is the glass of fruit juice. Grapefruit juice can be used as a first course or as a beverage accompanying the meal. As such it acts as an appetizer by bringing the salivary glands into action. In warm weather it may be served iced. Incidentally, fruit juices have an important place at all functions when drinks are served, but Grapefruit juice is more than a mere drink, it is a BEVERAGE.

SERVE 8 OZ. GLASSES OF FRESHLY EXTRACTED GRAPEFRUIT JUICE

JUICE.—2. There are many other ways of serving Grapefruit. A fresh fruit cup, a salad or a fresh fruit dessert, using orange, or grapefruit as a base, offer other ways of including these fruits in the menu.

Citrus fruit cup (to serve 25).—6 cups orange segments. 6 cups grapefruit segments. 6 cups shredded dates, stoned cherries or seeded grapes. 1½ cups sugar. . . . a few sprigs of mint.

Peel oranges and grapefruit, removing with a sharp knife all skin and inner membrane down to juicy flesh. Cut out segments on each side of dividing membrane and lift out.

Combine all fruits and sprinkle with sugar. Garnish each serving with mint sprig, if desired.

Fresh fruit salad bowl.—8 cups orange or grapefruit segments. 4 cups apple

slices. 4 cups banana slices. 2 cups cherries. $1\frac{1}{2}$ cup orange mayonnaise. $\frac{1}{2}$ cup orange juice.

Use red skinned apples. Core but do not remove peel. Cut in thin slices. Stone cherries. Combine fruit with mayonnaise, blended with orange juice. Do not use too much dressing but enough to blend. Arrange in large salad bowl lined with lettuce.

Other fruits in season, such as grape, melon, peach or pear may be substituted for any of the fruits, except Grapefruit and orange. (Calif. Citrograph, May 1939 p. 268.).

3. Grapefruit in syrup.—A popular first-course as an appetizer. Canned grapefruit may be used out of season and served iced with a cherry and a little whipped cream.

To prepare this dish at home, take fresh grapefruit and segment as given in "Citrus fruit cup". Make a sugar syrup by adding 2 cups of sugar to 3 cups of water and bringing to a boil. Place the grapefruit segments in the syrup and simmer for 7-8 minutes. Cool or ice and serve in melba glasses with a cherry and whipped cream.

Availability of Fresh Grapefruit.—Readers of this article will be pleased

to learn that Grapefruit is now being grown in several gardens scattered all over the province, although the area at present is small as compared to other citrus fruits, but it is increasing rapidly day by day. It is now announced for the benefit of intending purchasers that Grapefruit can be had direct from the following fruit gardens in the Punjab:—

1. M/s. Indian Mildura, Fruit Farms Ltd., Renala Khurd, District Montgomery.

2. The Manager, The Hon. Ch. Sir Shahabuddin's garden, Wan Radha Ram, District Montgomery, N. W. R.

3. Manager, Gangapur Estate, P.O. Gangapur, via Buchiana, N.W.R.

4. Manager, The Parkarabad Estate, Parkarabad, district Sheikhpura.

5. Manager, Chenab Gardens, Chak No. 45 G.B. via Gojra N.W.R.

6. Manager, Jamalpur Fruit Farm, Jamalpur via Sarna, N.W.R.

7. S. Kartar Singh Diwana, P.O. chak 370, Sardarwala, district Sheikhpura, via Buchiana, N. W. R.

8. Manager, Renala Estate, P.O. Renala Khurd, district Montgomery.

9. S. Inderjit Singh, chak 79 J.B., via Sarshamir Road N.W.R. (Lyallpur).

10. Manager, Dr. Cheema's Fruit Farm, Montgomery.

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بخشی کھنڈا لال اینڈ کوٹ کمپنیل کمشنر گوجرانوالہ کے باغ سے خرید کر دیے۔
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crease the yield
of your fruit trees?

And that they can better the *quality*
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INDIAN BEE JOURNAL,
JEOLIKOTE, (Distt. Nainital, U.P.)

While replying please mention the Punjab Fruit Journal.

How and when to root-prune Citrus Trees

By

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Fruit Section, Lyallpur.

It has been observed that some citrus growers in our province are in the habit of practising such cultural operations as "rootpruning" and "root exposing" every winter, irrespective of the fact whether the conditions of growth and fruiting and the climatic factors of the locality admit of the same or not. Consequently the results obtained are not only discouraging but detrimental, in most cases. The set-back received by the trees is often so great that it becomes extremely difficult, if not impossible, to revive their vigour.

Just as it is important for a physician to diagnose, properly, the cause of the disease before prescribing, it is equally important for a fruit grower to understand the purpose for which a particular cultural operation is practised. The mere fact that root-pruning brings about fruiting in non-fruiting trees is not enough to serve any useful purpose. In fact, this had led to the belief that every non-bearing tree could be induced to bear fruit by resorting to root-pruning which is not true. Leaving aside ignorant fruit growers, several educated people are also known to have adopted this practice, as a routine operation in their

gardens, without taking into consideration the climate of the locality and age and condition of the tree etc.

There are various causes that are responsible for non-bearing in citrus trees, such as inherent barrenness, unsuitable climate and soil, close planting, defective methods of manuring and irrigation, prevalence of insect pests and diseases etc. In this article, however, it is intended to deal with only two classes of trees both of which bear very little or no fruit due to disturbed nutritional conditions. Before describing these two types it is essential to explain, in brief, the food requirements of citrus trees. The most important food constituents required by the trees, for their growth and fruiting, are nitrogen, phosphorus, potash and lime which are taken up by the trees through their roots. It is, therefore, very essential that these food constituents should be abundantly present, in the soil, in an available form and if any one or all of these are lacking, the same may be added to the soil in the form of manures. Fortunately, our soils are rich in all the above plant-food nutrients excepting nitrogen which, along with organic

matter, is the determining factor in raising commercially productive citrus crops. It is also known that both the lack and excess of nitrogen are responsible for unfruitfulness in citrus trees. Lack of nitrogen results in undernourished and weak trees, while an excessive supply of this element produces trees with excessive vegetative growth. These two types of trees are dealt with below :

Trees with Excessive Vegetative growth (Unproductive trees).—If the trees, after reaching their bearing age, tend to grow very big and show excessive vegetative growth, producing long shoots with large dark-green leaves, without fruiting or produce a few large sized, green, thick skinned fruits of inferior quality, it may be safely assumed that this condition has been brought about by excessive nitrogen being made available to the trees. The remedy of this trouble, obviously, lies in restricting the nitrogen supply by root-pruning and withholding nitrogenous manures and excessive irrigation water.

By root-pruning, the feeding area of roots is reduced and nitrogen supply to the leaves and branches is restricted proportionately. The withholding of excessive irrigation water also serves the same purpose. Water is the medium by which nitrogen is carried and, consequently, with the reduction of water supply the in-take of nitrogen is proportionately reduced.

Root-Pruning.—This operation should be carried out from 15th to 31st January in the Punjab. The soil, round the trunk of the tree, is dug out to a depth of 9 inches in a ring, 3 feet wide, leaving one foot of the soil from the trunk

undisturbed. The soil thus dugout is removed from the ring; small fibrous roots in this area are cut and the trees allowed to remain in this condition for about a week. After this, the soil from each tree is mixed with 1-2 maunds of well rotted farm-yard manure (depending upon the size and age of the tree) and replaced in the ring. While refilling the ring, care should be taken to press the soil and manure hard into the ring. Immediately after this, irrigation water is applied.

Young citrus trees, before reaching their bearing age, should never be root-pruned, however vigorous and strong growing they may be. In fact, during the early unproductive age of the tree, vegetative growth should be encouraged so that the tree may develop strong scaffold limbs to bear the weight of the crop later on.

Under-Vegetative Unproductive Trees.

—Trees under this category are weak, sickly in appearance and stunted in growth, producing a few short shoots only. General yellowing of leaves occurs over the entire tree, with greater severity on fruiting branches. Individual leaves lose their green colour and turn pale. Withering or drying back of the terminal shoots is also often observed. The trees flower profusely but set little fruit, most of which drops premature. The fruit that is left on the trees is under-grade and poor in quality. This condition, in the tree, is brought about by the lack of nitrogen and the remedy, therefore, lies in adding nitrogen to the soil in the form of either bulky organic manure like farm-yard manure or artificial nitrogenous fertilizers like sulphate of ammonia. Where there is

scarcity of farmyard manure, it can be applied to the trees in conjunction with ammonium sulphate. If organic matter is already sufficient in the soil, sulphate of ammonia alone can be used. In hard soils, with little organic matter, ammonium sulphate may do much harm instead of any good and consequently, in such soils, farm-yard manure must be added. If farm-yard manure is not available in sufficient quantities green manuring should be done instead.

The method of manuring citrus trees need not be repeated here as it is described in detail in leaflet No. 109 of the Department of Agriculture, Punjab, which may be consulted for reference on the subject.

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HEALTH NOTES

Compiled by

K. L. KOHLI, M.A., L.S.G.D.

Apples rated high as benefit to diet.—"When foods are selected on the basis of total value in the diet, rather than on the basis of their chemical content, apples rate far higher, in the scale of desirable goods, than they are generally credited with in quoted lists", Dr. Ira A. Manville, of the division of Nutrition in the Oregon medical school, stated recently in an address to short course students at Oregon State College.

"Foods cannot be fairly compared on the basis of calories, mineral content or even Vitamin content alone," explained Dr. Manville. "Some cereals, for example, show good values for phosphorus, in chemical analysis, and yet may hold that phosphorus in an entirely unavailable form. The same is true in regard to the calcium content of spinach.

"It is quite true, that the apple does not contain much calcium, and yet, because of other attributes, it will actually increase by 12 per cent the absorption of calcium from a given diet in comparison with what would occur if the apple were omitted from the diet."

(Better Fruit, April 1940, page 8).

2. Citrus Diet for Horses.—Some race-horse owners, if we are to believe the public prints, are finding their horses feel better and run faster when citrus

fruits are added to their daily diet. And why not? Science has proved the value of citrus in human feeding, so it ought to be good for beast as well as man.

Moral.—If you want to feel and run like a "Seabiscuit" don't forget your daily citrus juice.

(California Citrograph April, 1940, page 173.)

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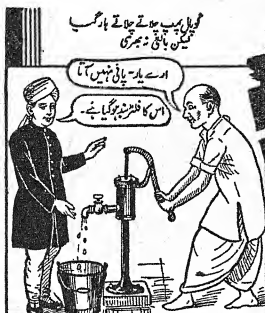
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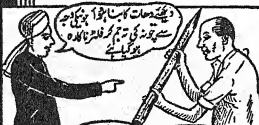
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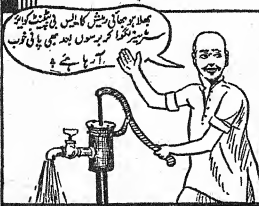
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GREEN MANURING

By

Mr. K. R. Verma, B. Sc.,

Indian-Mildura Fruit Farms,

Renala Khurd.

Green Manuring is practised on a small scale in India by the Agriculturists in general. It comprises the ploughing under of crops like 'Guara,' 'Arhar,' 'San,' 'Berseem,' 'Senji' etc. In reality it means turning-under crops either grown for this purpose or utilized in this manner. The turning-in of the dry stubble of a legume, although undoubtedly of benefit to the soil, cannot be regarded as equivalent to the ploughing-under of an entire green crop.

The object of Green Manuring is to replace in the soil the fertilising ingredients which were taken from it to feed previous crops. In addition, depending upon the bulk and character of the green manure crop, organic matter and nitrogen, not previously contained in the soil, are added. By its decay this organic matter gives rise to beneficial soil bacteria, provides these bacteria with food, assists in liberating mineral foods and improves the physical condition of the soil.

Decayed organic matter or humus renders heavy lands lighter and makes them easier to work. It improves the moisture retaining ability of light soils. It has been estimated that although 100 lbs. of sand can only retain one quarter of its weight of water, and the

same quantity of clay only one half, yet 100 lbs. of humus can absorb double its own weight of water. Besides other functions, organic matter acts as a water reservoir. Soils well supplied with it can, therefore, hold more moisture without becoming saturated.

In tropical and sub-tropical countries, organic matter, in cultivated land, is lost more rapidly owing to the burning sun and in some places manure supplies are generally insufficient. Laying down pasture is often inconvenient and impracticable and very expensive. To meet all such needs green manuring is a safe and quick alternative.

Any crop suited to local conditions may be used for this purpose but as a rule legumes are preferred by reason of their ability to absorb free nitrogen from air owing to the action of organisms living in the nodules on their roots, their vegetative parts contain more nitrogen, of which only about one-third has been taken from the soil and two-third from the air. This two-third therefore, forms a distinct gain to the soil when the plants are ploughed under.

Legumes being also deep rooted, draw upon the food supplies of the sub-soil, storing it in their tissues and, in decom-

position, release it for the use of succeeding surface feeders.

The nitrogen contained in a green manure crop is in a more available form than that contained in farmyard manure. It has been estimated that, taking the nitrogen content of Nitrate of soda at 100, green manures contain an availability of 65, as against only about 45 for farmyard manure.

Therefore, the principal consideration in the choice of a legume crop should be (a) the weight of green fodder produced per acre (b) the plant food contained in it (c) the ease with which the plants can be turned (d) the rapidity with which they will decay (e) the length of time the crop will occupy the ground.

At the Indian Mildura Fruit Farm, we have tried 'Guara', 'Arhar', 'San-Hemp', Cow peas, 'Mash', 'Mungi', 'Moth', 'Masur', Gram, Lady Painted Beans, Velvet Beans, 'Senji', 'Berseem', 'Shaftal', and Lucern, but we have found nothing as good as 'Guara', 'Arhar' and Velvet Beans when they are ploughed under. The effect of 'Guara' is noticeable after a year whereas the effects of 'Arhar' and Velvet beans can be seen after a few months from the time it is ploughed under. The land is made more pliable with "Guara" than with "Arhar". It is true that the crops of these legumes are

very difficult to plough under. This difficulty can be partially overcome by sowing the above legumes thickly to prevent the crop growing excessively high.

No hard and fast rules can be made for the ploughing-under of green manure crops but the precise time of ploughing a green crop under is of much importance and it is dependent upon several conditions, among which are the season of growth, the condition and character of the soil, the degree of maturity of the green crop as well as weather and seasonal conditions. Generally speaking green crops should be ploughed in when they are full of moisture, since they then decay most quickly especially in light soils. If a green manure crop is allowed to become so mature as to contain a large amount of dry, coarse and woody stumps, decomposition takes place slowly and the material remains unchanged in the soil for a considerable period of time. This results in the drying out by increased evaporation, caused by abnormal looseness of soil and, consequent upon this condition, extensive destruction of the soil bacteria. A similar result may occur if a green crop is ploughed under when a soil is dry. Best results can accrue only when there is moisture in the soil and heat to ensure prompt decomposition of vegetable matter.

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Japanese Fruit or Persimmon

(DIOSPYROS KAKI)

By

Ch. Mohd. Aslam Khan,

Superintendent Jamalpur,

Fruit Farm, near Pathankote.

This fruit is of only recent introduction in India. It is also being grown in large areas in the Southern States of U.S.A. where it was introduced from Japan. The great attraction of the fruit is its very bright red colour. In taste it is very sweet but lacks flavour. These fruits, used fresh, are delicious and equally so in creams and other frozen mixtures.

Persimmons grow readily from seed, but the improved varieties must be reproduced by grafting. Budding is also said to be a successful method of propagating these trees. The stock principally employed is the persimmon seedling plant. Layering, in pots, during the month of August was tried on our farm, but it met with no success. Cuttings have given a small percentage of success. It is probable that layering in spring may prove successful.

As regards its soil requirements, it likes a deep, reasonably heavy well drained soil. It does well on clayey soils when they are not too compact. The tree seems to thrive in any good soil, where other fruits do well. The plants appear to make larger growth on heavy soils than on light sandy soils, but

satisfactory results have also been obtained on light sandy loam.

It is suggested that before actual planting is taken up, the land be prepared in advance by green manuring soybeans, or any other leguminous crops, to enrich the soil. Planting can be done in the months of January or early February. The trees may be spaced 18—20 feet apart. The roots should not be allowed to dry during planting. When planting the tap root may be cut, to a small extent, to encourage vigorous rooting. This plant requires a sufficient supply of soil moisture.

Pruning is necessary in the first few years. After the plants are set, they should be headed back to a height of 18 inches. In the following winter the branches should be thinned out leaving only 3 or 4 well placed branches on the tree. In the next few years the aim should be to give the tree a typical globate form.

The fruit ripens during the months of October and November. It should be picked sometime before ripening, at a time when the colour is turned yellow, but when the fruit is still hard. It should then be wrapped in paper and kept in a

warm room for curing purposes. It is fit for eating when it gets as soft as jelly, otherwise it is astringent. Fruit ripened in the above manner is as good as ripened on tree. If the fruit is to be exported, it should be dispatched as soon as it is picked from the trees. The fruit has great keeping quality. When stored, it will keep in good condition even for as long as a month.

Protecting the fruit from birds is an important factor. Being bright in colour it attracts birds such as the "Bulbul", which get through even wire netting, when put over the trees. In the plains the fruit suffers much from the moist heat during the rainy season, it is therefore necessary that the fruit be sheltered by the foliage of the tree itself or other shady trees.

Persimmon trees are being tried since the last 15 years in the Jamalpur Fruit Farm where the annual rainfall amounts to almost 50 inches and maximum summer temperature is slightly more than 100° F. The trees are quite well grown and bear profusely but the fruit cannot be termed excellent. Moist

summer heat proves harmful to the fruit and spoils its colour and skin.

The following varieties have been tried and their characters noted, as follows:—

1. **Twentieth Century.**—Fruit elegant, large, sweet and juicy, colour yellow.

2. **Delicious.**—Large size, oblong shaped, bright red in colour.

3. **Hyakume.**—Oblong early variety ripens in september, 5½ inches, one of the largest fruits.

The Persimmon is decidedly a cold region fruit and therefore it is not possible to grow it on a commercial scale in the plains. A few trees in a shady corner of a garden, where moisture can be retained steadily, may prove successful.

Note.—It is indeed encouraging to receive such articles from our practical fruit growing members. We hope to give an exhaustive note on Persimmon cultivation in one of coming issues of the Punjab Fruit Journal.—Ed.

To Subscribers of the Punjab Fruit Journal

Most of the subscribers of the Punjab Fruit Journal started subscribing to the journal from October 1939. With the supply of this issue their annual subscription expires. They are requested to remit Rupees three by return to renew their subscriptions during this quarter, failing which the next issue of the journal will be sent per V. P. P. of Rs. 3/8/-

Candying "Bers" (Jujubee)

By

S. Bal Singh, M. Sc. (Calif.),

Assistant Fruit Specialist, Punjab.

Jujubee (Ber) grows practically wild in many parts of the Punjab and even the improved and grafted varieties of "ber," with very little attention and care, grow luxuriantly and bear in abundance. Since the fruit is not used in any other form except in fresh condition, the season being short and fruit being plentiful, it fetches very little income. In fact, its very abundance coupled with cheapness have so much lowered it in the estimation of well-to-do people that it hardly finds a place on the table of even middle class people. A great deal of the fruit goes to waste every year and prospective fruit growers do not even consider it worth while now to include this fruit in the scheme of their future fruit plantations.

As a contrast with this, it may be interesting to note that the United States Department of Agriculture has taken special pains to introduce this fruit in the United States and a special farm has been established in California for the study of this fruit alone. The fruit is favourable compared by them, in one of their annual reports, to the finest dates, especially when the fruit is properly candied. The method of candying 'Bers' has been evolved in the Fruit Preservation Laboratories of the Fruit Section, Punjab Agricultural College and Research Insti-

tute, Lyallpur. It is very simple and easy to follow. It is:—

1. **Selection of Fruit.**—Select for this purpose "bers" that are of a large size, free from blemishes and that are neither over-ripe nor under-ripe, i.e., when they are of yellowish colour. Wash the fruit thoroughly to remove dirt.

2. **Puncturing the Fruit.**—Usually the fruit as a whole is candied, but if need be, the fruit can be cut into two halves and the stone removed. Then the whole fruit or the cut fruit, as the case may be, is punctured all over with the help of sharp wooden tooth pick, so that sugar penetration inside the fruit may be rendered easy. Match sticks, the ends of which have been sharpened with knives, can also be used for puncturing the fruit.

3. **Boiling or Cooking the Fruit.**—After puncturing the fruit, place it in the muslin cloth and immerse in boiling water for 2-3 minutes. This is done to render the fruit soft, as sugar penetrates more readily in tender fruits. This boiled fruit is then put into glazed earthen pots or glass ware.

4. **Preparation of Syrup.**—Prepare sufficient syrup to cover the fruit, by adding one cup of sugar to three cups of water. Syrup thus prepared contains

about 25% sugar. Heat the syrup to boiling and, while still hot, immediately pour it over the boiled fruit placed in earthen or glass jars. Instead of sugar alone syrup can also be prepared by putting half of sugar and half of glucose. The addition of glucose prevents the fruit from hardening and reduces crystallization of sugar in the candied fruits. It also gives the finished product a glossy appearance.

Regarding the use of glucose, as pointed out above, it may be mentioned that in foreign countries certain type of syrups like corn syrup, etc., which are rich in glucose, are used for the production of fruit candies on a commercial scale. Such syrups are not available in this country and the glucose obtainable in the market here is much too expensive.

Methods for producing the desired amount of glucose in the candying cane-sugar syrup by the addition of acid are being tried in the laboratories. In the meantime the product meant for home-consumption may be prepared by the use of cane-sugar syrup alone. The product thus prepared, if properly packed, will keep well at least for three or four months after which it will tend to become hard and brittle.

5. Gradual Increase of Sugar.—

Concentration of sugar syrup is increased every day. This is done by removing the syrup from the fruit and adding to it $\frac{1}{4}$ cup of sugar (i.e., $\frac{1}{4}$ th of the amount of sugar used on the first day) and heat it to boiling and then

pour it over the fruit in the earthen jar. Everyday repeat the above process (i.e., removing the syrup from the fruit and adding to it $\frac{1}{4}$ cup of sugar, heating to boiling and then pouring over the fruit) until the syrup reaches the consistency of honey. This will take about 8—10 days and the concentration of sugar in the syrup will be from 70—75%. After the syrup has become thick like honey, the fruit should be kept in it until the sugar has thoroughly penetrated the fruit which may take about 4-5 days. No harm will result if the fruit is kept in the syrup a few days longer.

6. Drying the Fruit.—After the fruit has remained in the thick syrup for several days, it may be removed from the syrup and placed on the wire screen, so that all the syrup from the fruit is drained off. Keep the fruit on the screen, until it has dried to such an extent that the outside of the fruit ceases to be sticky. This takes place generally in 4-5 days. Then this fruit may be dried either in the sun or in some warm room. When the fruit has dried sufficiently, it may be packed in jars or card-board boxes. This candied fruit can be kept several months and used whenever required.

If during the process of candying any fermentation is noticed, then whole syrup along with the fruit should be boiled for 2-3 minutes and poured in other jars which have been washed with hot water and dried in the sun. The syrup left over, can be used again in candying berries or other fruits.



Anthracnose of Grape Vine

By

S. Dyal Singh, M. Sc. (Hons.),

Mycological Assistant, Agricultural

College, Lyallpur.

Anthracnose of grape vine has been observed in almost all the orchards where grape vine cultivation is being done in the province and in certain years causes considerable damage.

The disease affects all the green parts of the vine—leaves, shoots, blossoms and berries, but it is more common on leaves and shoots.

Symptoms on the leaves.—The fungus causes irregular spots of pale grey colour with dark borders.

Symptoms on the shoots.—On the shoots at first small brown spots appear which become depressed in the centre and raised at the border. These are more or less elliptical. Later on the centre becomes more depressed and the colour turns greyish. Finally the bark ruptures and in severe cases the underlying wood looks charred. The spots then look like scars or cankers.

Symptoms on blossoms.—The blossoms, when affected, dry and fall off.

Symptoms on the berries.—Characteristic spots resembling the spots of bird's eye are formed. These at first appear as small dark brown areas, and later turn greyish in the centre wherever the cuticle is ruptured, but the border re-

mains dark. The spots increase in size and assume circular shape. Between the grey centre and the dark border is a well defined band of light red colour. The appearance thus resulting has given rise to the name of bird's eye spot. If young berries are affected they may sometimes outgrow the disease but mostly they wither-up and dry. If severely attacked they may crack exposing the seeds.

Cause.—The disease is caused by the fungus which is called *Gloeosporium ampelophagum*. It produces fruiting bodies (acervuli) on the affected portions. From these the seeds of the disease (spores) are liberated and fall on green parts of the vine and cause infection. The disease becomes destructive during the wet and cool season. The fungus is supposed to hibernate during winter in lesions on the shoots. In spring, spores from fruiting bodies ooze out and cause fresh infection.

Control.—The following measures are adopted for the control of the disease in European countries:—

- (1) Pruning out and burning of diseased wood.
- (2) Spraying dormant vines with lime sulphur solution diluted one to nine.

(3) During spring spraying the vines with Bordeaux mixture (4:4:50) (a) when the shoots are eight to twelve inches in length, (b) just before the blossom buds open, (c) just after the blossoms fall, (d) ten to fourteen days later, (e) and again after ten to fourteen days.

Under Lyallpur (Punjab) Conditions.
The following measures have proved very useful in preventing the disease:

(1) Removal of the diseased wood and burning it.

(2) Spraying the vine with rosin soda Bordeaux mixture in the end of March, and spraying second time in the first week of June. The formula and preparation of the Rosin Soda Bordeaux mixture is given below:—

Formula

(Part A.)

Copper Sulphate	3 lbs.
Unslaked lime	3 lbs.
Water	50 gallons

Put copper sulphate in a piece of muslin, immerse it in an earthen-ware (Ghara) containing 5 gallons of water, and leave it to dissolve. Slake the lime in another vessel, adding water little by little. Add more water to make the solution up to 45 gallons. Strain the lime solution through a piece of muslin or gunny bag. Mix the two solutions stirring well.

(Part B.)

Rosin	2 lbs.
Washing Soda	1 lb.
Water	1 gallon

The ingredients of part B should be boiled till the solution becomes of amber colour. Then add part B to part A. Addition of part B increases the adhesiveness of the solution which consequently sticks well on the new shoots and leaves.



A note on the Role of Minor Elements in the soil of canning crops

By

GIRDHARI LAL Ph.D. (Lond.)

D. I. C.,

Asstt. Fruit Biochemist, Lyallpur.

The usefulness of the application of manures, containing major elements like phosphorus, potassium, sulphur, calcium, nitrogen etc., to the soil, for growing various kinds of crops, is admitted on all hands. Recent researches, in the domain of the soil science in U. S. A. have demonstrated that the presence of minor elements like manganese, copper, zinc, strontium, boron etc., in combination with major elements, improves very greatly, the quality of vegetables like tomatoes, beets and peas and also considerably affects the yields. Crops grown on such soils have been found, on analysis, to contain adequate quantities of these minor elements which, according to accepted notions of the present day medical science, are so essential for preventing a number of human ailments.

In this connection it will be interesting to summarize the observations of Lee Vanderlindin, Mid-West Fertilizer Manufacturers' Association, Ohio, U. S. A., regarding the value of minor elements in relation to human ailments.

Lack of:—

Manganese anemia, general debility,
gout,

Causes:—

Iodine	rickets, goiter, skin eruptions, neuritis, neuromyositis, obesity.
Sulphur	constipation, liver and blood diseases.
Magnesium	underweight, skin disorders.
Iron	headache, anemia, asthma, exhaustion.
Copper	anemia.
Potassium	constipation, acidosis, heart trouble.
Calcium	eczema, rickets, stomach trouble.
Sodium	rheumatism, bladder troubles, kidney diseases and stomach malfunction.
Phosphorus	growth retardation, rickets, mental exhaustion.

The importance of minor elements like iodine, copper, manganese, etc., in the human diet is, therefore, amply recognised. Similarly some of the ailments in cattle have also been attributed to the deficiency of these minor elements in the cattle feed. The best and the normal way, therefore, to supply these elements to animals and to man, is in the feed and food respectively through plants, vegetables and fruits grown on

soils treated with adequate quantities of manures containing such elements.

In U.S.A., a large number of commercial farms, specialising in the growing of canning crops, and a number of Research Institutes, have carried out, very successfully, growing trials of canning crops, on soils artificially supplied by these essential elements. It has been claimed that the Canners, while using such crops, have the double advantage of attaining both high quality and health values in their products, specially when such products have been found, on examination, to contain the desired amounts of these minor elements.

Such latest discoveries in soil science, according to Newman (Canning Age, October 1939) teach canners the following lesson.

"See that your fruits and vegetables are grown in ground that contains all the minor elements. See that your growers study and follow the conclusions of soil scientists. See that the soil your growers use is supplied artificially, when necessary, with the essential elements."

Further researches in U.S.A., on the effect of these minor elements, as affecting physiological diseases of crops, have also yielded some very interesting results. Some of the severest types of devastating physiological diseases of tomatoes and beets, for instance, have been attributed to the absence of these minor elements. Boron and manganese deficiency, in tomatoes, causes black spotting and cracking of the fruit respectively. Similarly Beet canker, which causes damage to the beet crops, is a boron deficiency disease.

The type of research, as mentioned above, deserves special attention in India. Much could be done in the prevention of mineral deficiency diseases which are fairly common these days in this country and may be attributed to the poor quality of mineral food which is probably lacking in the minor elements mentioned above. Such researches will no doubt involve time, money and hard labour, but in view of the results which may be achieved, as has been done elsewhere, the problem certainly requires serious thinking of the Horticulturists, Agronomists and the Soil Scientists of this country.

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Chronicle of the Fruit World

Compiled by

K. L. KOHLI, M.A., L.S.G.D.,

Asstt. Secy. Pb. Fruit Development Board.

1. Progress made by the Fruit Nurseries of the Punjab Agricultural Department.—The sale of plants, from the departmental nurseries in the province for the year ending 30th June, 1940, was higher than that of the last year. The following statement shows the number of plants sold from the various nurseries, each year, from 1935-36 to 1939-40.

Kind of plants	1935— 1936	1936— 1937	1937— 1938	1938— 1939	1939— 1940
Evergreen ..	3861	13906	21785	27000	31634
Deciduous ..	2838	6959	12353	12061	11734
Totals ..	6699	20865	34138	39061	43368

Out of the total number of plants sold from all the nurseries, Lyallpur nursery alone supplied 16,289 plants as against 14,705 plants, during last year.

Besides this, the various nurseries also sold out 8,139 cuttings and stock seedlings. In addition to this about 1,500 mango grafts were produced and supplied from the Jamalpur Fruit Farm and Brij Lal Orchards, Pathankot, under the supervision of the Fruit Specialist.

The total number of plants successfully raised during the year amounted to 88,932. Besides this, khatti seed, enough to raise over a million and a half seedlings, was sown at the various departmental nurseries.

Topworking of Wild Fruit Trees.—Topworking of wild 'ber' trees, is increasing in popularity. In all 38,065 trees were topworked during the year, of which 18,438 were done by the staff of the Fruit Specialist, Lyallpur and the rest by the district Agricultural Staff.

The Olives topworked at three sites on the Rawalpindi-Murree Road are making satisfactory growth, particularly the trees at a lower height. Some of these trees bore some

fruit for the first time. They have not yet attained the age for normal bearing.

2. Possibilities of Inter-cropping of Young Orchards.—It is often said that fruit farming in the beginning, when the trees are too young to bear any crop, is a drain on the purse of the fruit grower and he has to wait for a few years to get any return for his outlay. This is completely falsified by the income figures of the inter-crops raised in several newly planted departmental experimental gardens in the province. For instance, at Attari Farm Garden, inter-crops grown in an area of 19½ acres fetched a gross income of Rs. 1,561/4/8 or about Rs. 80/- per acre in spite of the fact that quite a good portion of the garden area occupied by irrigation basins of the trees and channels, etc., could not be inter-cropped. Peas, in an area of 3 acres 2 kanals, were sold for Rs. 430/-, i.e., at about Rs. 132/- per acre. At the Risalewala Progeny Garden a gross income of Rs. 1,210/9/- was realised from inter-crops which works out at Rs. 46/9/- per acre for the whole garden, including the area occupied by roads, trees, etc., against a gross income of Rs. 52/9/6 per acre from Risalewala Farm. Berseem inter-cropped in fruit trees at the Mutian Farm, in an area of 3 acres 7 kanals and 17 marlas, fetched an income of Rs. 790/11/4 which works out at Rs. 198/9/9 per acre. At the Horticultural Research Sub-Station, Montgomery, the yield of gram inter-cropped in ten acres of garden area averaged about 16¼ maunds per acre and the gross income from inter-crops in an area of one square was about Rs. 1,600/-.

3. Citric Acid Successfully Prepared in the Laboratories of the Fruit Section, Lyallpur.—Galgals weighing 3,500 lbs. which yielded about 1,200 lbs. of juice, were used for experiments on the manufacture of citric acid and pectin. A satisfactory sample of citric acid has been prepared and further experiments to study

the loss of acid at different stages of manufacture, final recovery of the acid, etc., are still in progress.

4. Extension of the Canning Plant at Lyallpur.—An up-to-date juice and squash making plant has recently been fitted at a cost of about Rs. 10,000/-. This plant consists of a juice extracting machine, pulp machine, juice pump, syrup making tank, agitating tank, a syphon filler, corking machine, bottle washing machine, etc. It has a capacity of 50 dozen bottles of squash per day.

5. All-India Fruit Preservation Station at Lyallpur.—At the meetings of the Advisory Board of the Imperial Council of Agricultural Research held in Simla in June of this year, a good deal of attention was given to old and new schemes of fruit research.

A scheme which attracted a good deal of attention and occasioned a certain amount of controversy was that for an all-India Fruit Preservation Station. In Britain there is a station at Campden which carries out research work and gives advice on canned products, and it was felt that a similar station in India would be useful. The proposal was to locate it at Lyallpur, where there is already a strong Fruit Preservation Section in the Punjab Agricultural College. The matter will receive further detailed consideration by a specially selected smaller committee. The time is certainly opportune for the more rapid development of Fruit Preservation in India.

—(Indian Farming, August, 1940, page 363)

6. Scheme for Improvement of Coorg Oranges Recommended.—Among the new schemes recommended by the I.C.A.R., in the aforesaid meetings, was one for the improvement of the cultivation and marketing of the Coorg Orange. This well-known fruit is one of the indigenous citrus varieties and is propagated by seed. There is a good deal to be discovered and applied as regards its manuring, cultivation, pruning, insect pest and fungus diseases. Its marketing also presents special difficulties. The scheme arranges to investigate and deal with these problems.

—(Indian Farming, August 1940)

7. Dried Indian Fruits.—With a ready made market available for the product, the Imperial Council of Agricultural Research have turned their attention to the possibilities of founding a dried fruit and vegetable industry.

The Council have under consideration research into this method of profitably dis-

posing of the large quantities of surplus fruit which is now being grown in India.

Drying has certain advantages over canning, in that the latter process requires expensive equipment, cans are costly, sugar is dear and freight charges are high. The drying process, on the other hand, is cheaper and easily manipulated, once it has been learned, while freight charges are lower.

Other countries, which grow large quantities of fruit, dispose of a high proportion in dried form. In California, for instance, 20% of the crop is disposed of as fresh fruit, 15% is canned and 65% is dried.

The process has already been tried out in the North-West Frontier Province and samples of fruit dried at Tarnab Farm and sent to England were favourably commented upon. England imports 28,000,000 worth of dried fruits from foreign countries every year, and it should be possible for India to capture some part of that trade. There is a home market already in existence, for India imports Rs. 9,00,000/- worth of dried fruit from Afghanistan annually.

A large variety of fruit suitable for drying is grown in the North-West Frontier Province, where the canning industry has already been successfully launched. The scheme now under contemplation is for a full investigation into the drying process in the same province.

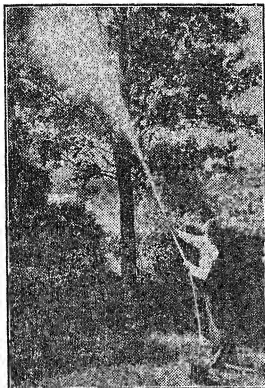
—(The Indian Industries, August 1940)



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Horticultural Knowledge from Far and Near

By

Mr. MUSAHIB-UD-DIN B.Sc. (Agri.),

Fruit Section, Lyallpur.

I. Preserving Fruits Without Sugar.—

Much fruit is annually made into jam or jelly, but owing to the shortage of sugar this season, the quantity of jam made will be governed by the sugar available rather than by the abundance or otherwise of fruits. Most fruits may be successfully preserved whole, without the use of sugar, but the only item which prevents a great increase of bottling in this manner, is the cost of bottles. Vacuum bottles, with spring clips, are the most simple to use as they need no attention with regard to fastening after being once placed in position, while the spring "gives" sufficiently to allow air to escape during sterilization.

If carefully selected fruits are used—and only these are worth preserving—and care is exercised in filling the bottles, a very attractive and extremely useful result may be obtained.

The fruits to be bottled should be gathered clean and dry and the bottles used should be in a like condition. Fruits gathered in a gritty and dusty condition should be well rinsed in cold water and dried before being bottled. Pack the fruits as tightly as possible in the bottles without breaking them and fill the bottles with cold water to the tops. Place the rubber rings, clips and caps in position, place the bottles in the sterilizer and fill the latter with water up to within an inch of the tips of bottles. Set the sterilizer over fire and bring the water slowly to a simmering point.

A little experience in this matter is very valuable, the hand may be placed on the lid from time to time and when it is found too hot for the hand to be held there, the bottles should be inspected. If the fruits are found to be as tight as when packed they are not sufficiently sterilized, but if they move about slightly, when the bottle is revolved in the fingers, when the bottle should be removed and fastened down.

A thermometer is convenient but not essential. The bottles should be placed in the sterilizer, as above, placed over the fire and brought very slowly to 155° F. or 160° F. in about an hour and a half, taking at least an hour to reach 140° F. and leaving them at the top heat for about five minutes.

This treatment will be found satisfactory for all soft and stone fruits, but when hard fruits are being dealt with, such as apples and pears, they require more heat and 150° F. should be reached in first hour and 180° F. or 190° F. in an hour-and-half and this latter figure maintained for about ten minutes.

When bottled in water, the fruits should not rise from the bottom of the bottle; where this occurs it is due either to an excess of heat or imperfect packing—usually the former. (Reproduced from an article by G. T. Elks Ardingly in the "Gardeners' Chronicle," No. 2794, Vol. C. VIII. Saturday, July 13, 1940.)

In these days of warfare great difficulty is being experienced in some countries in the production of sugar and this is really a good suggestion. The bumper fruit crops, which make large amounts of fruit surplus in those countries, can be preserved by the method described above and used afterwards for making jams, etc.

II. Vitamins from Grass.—

(1) Cut grass is made into hay and fed to animals whenever there is dearth of fodder. This is a common practice and is known to every one.

An American scientist suggests an alternative use of this cut and dried grass by turning it into Ketchup. Grass, when mixed with Salad, has been found to enhance its taste.

The dietetic value of grass was brought to light some time ago in a meeting of the

scientists in Kansas; a State, in U.S.A.

Grass was said to contain 140 times as much Vitamin A, 18 times Vitamin B and 14 times Vitamin C as in tomatoes.

Grass is also useful for the fowl as one of its constituents is conducive to egg production. (Hal. August 1940)

(ii) Common grass may provide a rich source of vitamins for human consumption according to recent scientific experiments. The grass is dried and processed by a special method to make it edible in many forms. In their grass research, scientists are using a colorimeter, an instrument that reveals the Vitamin content of a substance by colour. (Capital, August 29, 1940)

III. Effect of storage on Vitamin A content of canned tomatoes.—Pearl P. Swanson,

Gladys Stevenson and P. Mabel Nelson report that storage, at room temperature, of commercially canned tomatoes, for 42 months, did not change the Vitamin A value.

(Chemical Abstract. Vol. 34 No. II, June 10, 1940)

IV. Reduction of acid in Valencia oranges. In experiments made during 1937-38, spraying not only reduced the acid content of the fruit of that season but also seems to have had a "hold-over" effect on the acidity of the fruit in the following year. Recommendations are to spray the tree, in January (in S. Africa), with a solution of half a pound of super-phosphate (19.1%) in one gallon of water plus sticker.

(Horticulture, Abstracts, December 1939.)

RENEWAL OF MEMBERSHIP

"Ordinary" and "Regular" defaulting members of the Punjab Provincial Co-operative Fruit Development Board are requested that as their term of membership for 1940 will expire on 31st Dec., 1940 they should remit their renewal fees by Money Order. "Regular" members are required to remit Rupees six each while "Ordinary" members an amount of Rupees three only. "Life" members who have not completed the instalments of their life membership are also requested to do so now.

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**THE PUNJAB FRUIT DEVELOPMENT BOARD,
LYALLPUR.**

Annals of the Board

By

K. L. KOHLI, M.A., L.S.G.D.

Asstt. Secy. Pb. Fruit Development
Board.

During this quarter, the Finance Standing Committee and the Nursery Standing Committee of the Board, met on 3rd July, 1940, and 8th September, 1940, respectively. The decisions arrived at by these committees in their above meetings along with a number of other vital matters were reviewed by the Managing Committee in its meeting of 8th September. Salient decisions of the said committees are reported as under.

1. Budget of the Board for the year ending 31st March, 1941.—This being the first budget and expected expenditure being heavy, on account of taking in hand the Nursery scheme, it is regretted that the budget for the current year is in deficit. We expect that despite a heavy curtailment in several important items and abandonment of urgent programmes such as, fruit marketing, garden requirements supply depot, advisory work in districts etc., the year is likely to close with a deficit of about Rs. 2500|. The budget is summarized as under:—

BUDGET ESTIMATE FOR THE YEAR ENDING 31st MARCH, 1941.

The present year opens with a total cash balance as on 1-4-40 of Rs. 5513 19
Less general Reserve under by-law 28 based on the audited Balance Sheet for the period ending 31st July 1939. Rs. 466 0 8½
Rs. 5047 1 ½

Less Fruit Journal Fund based on the audited balance Sheet for the period ending 31st July 1939. Rs. 1398 2 1½

*The year, therefore, commences with opening balance of Rs. 3648 14 11

CONSOLIDATED BUDGET ESTIMATE, FOR THE YEAR ENDING 31st MARCH, 1941.

Name of Section.	Income.	Expenditure.	Surplus.	Deficit.
General Section	4350 0 0	2847 8 0	1502 8 0	....
Publishing Section	3225 0 0	3635 8 0	....	410 8 0
Nursery Section	4500 0 0	8117 0 0	....	3617 0 0
	Rs. 12075 0 0	14600 0 0	1502 8 0	4027 8 0

NET DEFICIT: —Rs 2525-0-0 (of the year under reference). The year, therefore, is anticipated to close with closing balance of Rs. 1123-14-11 (i.e. Rs. 3648-14-11 minus Rs. 2525-0-0 in addition to the Reserve and Fruit Journal Fund mentioned above).

*Note:—In addition to the above cash balance there is a considerable amount of stock of publications of the Fruit Journal and Bulletins valued at cost price amounting to Rs. 1367-11-3.

2. Significant progress of the Nursery Scheme.—20,396 citrus stock plants were budded in the season (February-

March). The scheme, despite limited funds, has been further extended to members, from next year.

Readers will be gratified to note that during this monsoon season 15,599 citrus plants have been budded, 7,566 plants at Mian Channu and 8,033 plants in the newly started nursery at Sardarwala. To keep up a continuity of supply, arrangements have been made to set up a Central Nursery at Lyallpur.

Despite financial handicaps, a survey of important peach and plum gardens of the province was taken up in May-June 1940, followed by a survey of the important mango orchards of the Karnal, Multan and Muzaffargarh districts in July-August 1940. In all 496 plum, peach and mango trees were marked. Negotiations are in progress for arrangements to supply quality mango grafts,

3. **Schedule of rates of citrus plants.**
—The schedule of prices (given below) of the plants, to be sold from the nurseries of the Board, would reveal that the prices, in general, are higher than those charged by the Government Nurseries but, on the whole, compare favourably with the Private Nurseries. This slightly higher rate, than the Government Nurseries, should not be grudged by members, when taking into consideration the initial heavy expenditure expected to be incurred (over Rs. 8,000/-) and the pains taken in the selection of bud-wood in order to produce plants of reliable parentage.

The following is the schedule of rates, along with plants available, in the respective nurseries of the Board.

S. No.	Name of plant & Variety	Number available at Mian Channu Nursery	No. available at Jamalpur Nursery	Total	Price per plant for non-members
1.	Malta (common)	3576	770	4346	-/10/-
2.	" (Red Blood)	1315	190	1505	1/-
3.	" (Musambi)	570	162	732	-/12/-
4.	Sangtra (Common)	397	1320	1717	-/8/-
5.	" (Nagpur)	—	35	35	-/12/-
6.	" (Laddu)	49	23	72	-/12/-
7.	Narangi	—	11	11	-/8/-
8.	Grapefruit (Duncan)	191	270	461	1/-
Total		6098	2781	8879	

Note.—(1) Members and Associates of the Board will be allowed a rebate of 25% on the above rates.

(2) A further rebate of 10% will also be allowed to indentors ordering more than 100 plants at a time.

(3) Members are advised to indent their orders evenly so as to cover all or most of the citrus varieties mentioned

above. The orders should reach the Hony. Secretary by the 10th December, 1940, for supply in February 1941.

4. (a) We heartily congratulate the following members of the Managing Committee for the King Emperor's Birthday honours conferred on them.

(i) Rai Bahadur for L. Prakash Chand Mehra, Member Municipal Committee Amritsar.

- (ii) Khan Sahib for Prof. Mushtaq Ahmed, Punjab Veterinary College, Lahore.

(b) The Governor of the Punjab has been pleased to appoint S. Satwant Singh Rais of Bara Farm, (a member of the Managing Committee of the Board) as one of the two non-official visitors of the Central Jail, Montgomery.

5. **Fruit Cess Bill.**—Since reporting in the April 1940 issue, a comprehensive draft of the Punjab Fruit Cess Bill has

been drawn up and deliberated upon by the Executive of the Board. The Ministry of Development is being approached to bring the Bill on Statute at an early date. The President of the Board, however, is very keen that, with a view to ensure a smooth passage for the Bill, in the legislature, it should have the maximum support of all fruit growers, big and small alike. An appeal to all fruit growers from the President will shortly be issued and it is hoped that there will be a ready response from them.

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